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INTERSTATE ROUTES 695 AND 93

BOSTON, SOMERVILLE AND MEDFORD

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DRAFT OF FINAL REPORT
INTERSTATE ROUTES 695 & 93
IN
BOSTON, SOMERVILLE AND MEDFORD

JANUARY 1965

PREPARED BY THE JOINT VENTURE OF

FAY, SPOFFORD & THORNDIKE, INC.

11 BEACON STREET
BOSTON, MASS.

CHARLES A. MAGUIRE & ASSOCIATES

15 COURT SQUARE
BOSTON, MASS.

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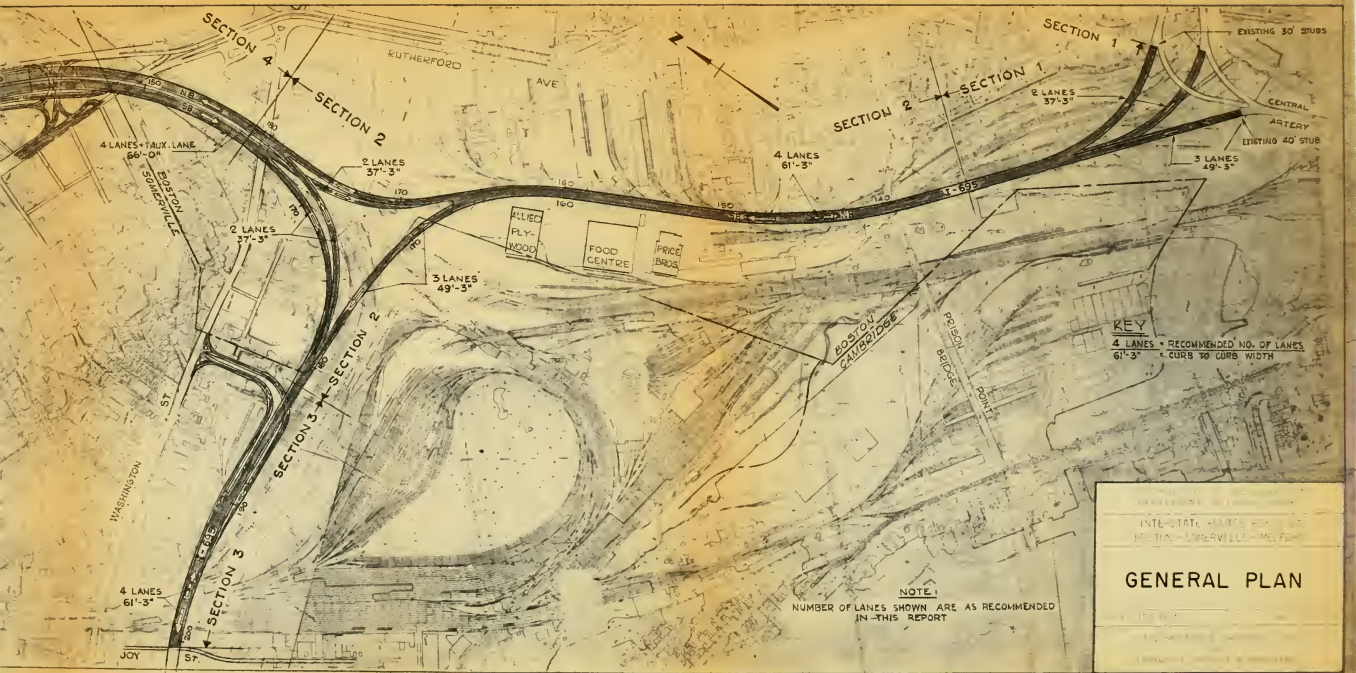
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PART I
INTERSTATE ROUTE 695
CITY SQUARE, CHARLESTOWN
TO
JOY STREET, SOMERVILLE

GENERAL DESCRIPTION OF STUDY AREA

The portion of Interstate Route 695 included in the scope of this report extends from its interchange with Interstate Route 95 near City Square in Charlestown northwesterly through the Boston & Maine Railroad yards to a point just westerly of Sullivan Square where it interchanges with Interstate Route 93. From this interchange with I-93, Interstate Route 695 extends westerly along the northerly edge of the Boston & Maine yards to Joy Street in Somerville. Interstate Route 93 extends northerly from its interchange with I-695 to a point just north of Cambridge Street in Charlestown. Said point is the junction of Part I of this Report which includes Sections 1, 2 and 3 and Part II which includes Sections 4 and 5.

Most of the Interstate System included in Part I of this Report is within the limits of property owned by the Boston & Maine Railroad, the only exceptions being the several properties along the northerly edge of the railroad yard which have frontage on Cambridge Street.

The range of possible locations of the Interstate System within the yard is confined to a relatively narrow limit. The extension of I-695 northerly of the interchange with I-93, just south of City Square, is considered in only one location between the interchange and Prison Point Bridge. Only one location for I-695 is feasible in Section 1 due to the

General Description of Study Area (Continued)

restriction of the Boston Sand & Gravel concrete plant and the proposed Charlestown station of the MBTA. Northerly of Prison Point Bridge, I-695 is considered in either one of two locations: (1) a location which parallels the ladder tracks that connect all the industries fronting on Rutherford Avenue, or (2) a location which passes westerly of three industrial buildings recently constructed within the railroad yard. Southerly of Prison Point Bridge both locations are identical.

The location of I-695 westerly from the interchange with I-93 is also confined to one of two locations within the yard: (1) along the northerly edge of the yard and (2) through the classification yard itself. This latter location would be based upon the complete elimination of the railroad tracks of the classification yard, it previously having been concluded that it would be impractical to attempt the construction of a double-deck elevated structure through the yard since it would so seriously impair the operation of the classification yard that it would be tantamount to its complete elimination.

The Traffic Analysis section of this Report concluded that on and off ramps serving I-695 to the west and I-93 to the north from Prison Point Bridge would not be feasible, and therefore are not included in the schemes presented in this report. The Traffic Analysis section, however, concluded that ramps serving the Inner Belt to the west would be feasible and advantageous if located westerly of the interchange with Interstate Route 93, and therefore all schemes have included these ramps.

The schemes presented herewith assume Prison Point Bridge to be rebuilt purely as a result of the present condition of this structure and the necessity of maintaining its present function as a major element of the circulation pattern in this area. The Metropolitan District Commission has the responsibility for the reconstruction of the Prison Point Bridge.

General Description of Study Area (Continued)

An important consideration affecting the various studies included herein is the connection proposed from Leverett Circle to the Mystic River Bridge, which also intersects the extension of Rutherford Avenue into the North End of Boston. This connection was studied as a requirement of this contract in order that the details of Interstate Route 695 could be planned and designed so as not to preclude the construction of this connection. The contract under which this study is being made was subsequently extended to include the ramp locations presently existing on that section of Interstate Route 95 at the intersection of the Mystic River Bridge and the Fitzgerald Expressway.

The North Terminal Area Study Report recommended ramps serving the Inner Belt and I-93 to and from the north near City Square. This pair of ramps was proposed to interchange with the arterial connection between Leverett Circle and the Mystic River Bridge. These ramps are included in the studies for Section 1, although as pointed out in the Traffic Analysis they are not considered to be feasible for inclusion in the initial construction phase since connecting roadways would not be completed at the time of initial construction.

SCHEMES STUDIED

The location studied for I-695 and its interchange with I-93 within the Boston & Maine Railroad yards in Boston and Somerville has been divided into two sections. Section 1 starts at and includes the uncompleted portion of the present interchange of I-695 and I-93 at City Square and extends northerly to a point just south of the Prison Point Bridge. This section was previously designed and known as Contract F.

Only one location was considered for the Interstate Route 695 in Section 1, although numerous studies were made as to the location of the major arterial streets which were studied in order that the Interstate System could be laid out in such a manner as not to prevent the future construction of the arterial system.

Sections 2 and 3, which include the balance of the Interstate System within the Boston & Maine yards from a point just south of the Prison Point Bridge on I-695 and extending northerly to an interchange between Routes 695 and 93 and thence westerly from this interchange to Joy Street at the westerly edge of the Boston & Maine yards, are presented as one section in this report because of the interdependence of each on the other. This section also includes the portion of I-93 from the interchange to Cambridge Street where it joins the portion of I-93 included in Part II of this Report.

In Section 2 two locations were considered southerly of the interchange with I-93 and two locations were considered westerly of the interchange with I-93. Each of these in combination resulted in four schemes for Sections 2 and 3. However, upon development of those schemes for the location of I-695 through the classification yard westerly of the interchange with I-93, it became apparent that any location through the yard

Schemes Studied (Continued)

would make it impossible to utilize the classification yard. Even if the expressway was to be constructed as a two-level viaduct structure over the yard it could not be designed without eliminating at least a half-dozen tracks, which would seriously curtail the capacity of the yard, and furthermore the numerous columns would make it impossible to maintain line-of-sight vision to the entire yard which is necessary to control the switching of cars to the various tracks and the application of the retarding mechanisms at the proper time.

Therefore, these two schemes were discarded and subsequently two additional schemes were studied and included herein, predicated on the yard being eliminated and the expressway constructed as economically as possible on fill rather than viaduct.

Those schemes which appeared to be promising were developed more fully with cost estimates and a list of their advantages and disadvantages. These schemes were drawn at a scale of 1" = 100' and are shown on plans submitted with this Report but not bound with it. Those schemes which contained definite and obvious disadvantages in comparison to other schemes studied were discarded, and they are included in this Report at a scale of 1" = 400'.

SECTION 1

Only one location was considered in Section 1 for I-695 and its connection to I-95, this being the location as designed under Contract F of the Inner Belt. The studies have shown that horizontal and vertical location of the Inner Belt and its connection, as designed in this contract, are valid for all considerations including its possible effect on new construction proposed for this area by the relocation of the MBTA mainline tracks to the north and by the new arterial connection between Leverett Circle, Mystic River Bridge and the extension of Rutherford Avenue.

Schemes Studied (Continued)

However, the specific details of the design of Contract F must be revised if this section of the Inner Belt is to be constructed in such a manner as not to preclude the construction of the new arterial streets, the proposed MBTA station for City Square, and the ramps proposed by the North Terminal Area Study to the Inner Belt in this section.

The bent and column layouts of Contract F must be revised in order to provide satisfactory alignments for the new arterial streets. At the time Contract F was designed it was concluded that the breakdown lane was not necessary. However, experience with the operation of freeways throughout the country, and particularly expressways in Metropolitan Boston, have conclusively shown that a breakdown lane must be provided throughout the length of the expressway system in order to maintain the capacity of the system and to provide for efficient operation of the system at all times. Therefore, it is recommended that the connections within this interchange be designed with two lanes and a shoulder for the ramps and three lanes and a shoulder for the main line which would taper at the throat of the connection to the existing stub ends. The taper section would have to be signed and so constructed as a breakdown lane since it becomes "pinched off" at the connection to the existing structure.

Furthermore, the Contract F section must be made compatible in cross section with the remainder of I-695. Also, since the time that Contract F was designed technical advances have been made in the development of commercially available steel for heavy fabrication which would permit an eleven percent increase in the design stress for the various steel components of the structure. Theoretically, this change would allow an eleven percent reduction in weight of steel required although practically it would permit only a six to seven percent reduction. This saving in material would be approximately equal to the

Schemes Studied (Continued)

amount of the cost to redesign this section of the Inner Belt. It is therefore apparent that the horizontal and vertical alignments designed in Contract F should be retained.

We present herewith four schemes in Section 1, each employing the same location for the Contract F section of the Inner Belt but offering the choice of various layouts for the arterial connection between Leverett Circle and Mystic River Bridge and its connection to Rutherford Avenue and Rutherford Avenue extended to the North End of Boston.

In 1964 the Legislature of the Commonwealth of Massachusetts provided that the Massachusetts Port Authority and the Metropolitan District Commission would have the responsibility for the design and construction of an arterial connection from Leverett Circle to the Mystic River Bridge, and it is assumed that the City of Boston would have the responsibility for the design and construction of Rutherford Avenue extended to the Charles River. The new bridge required over the Charles River for the proposed southbound roadway for Rutherford Avenue has already been incorporated in the design of the new Charles River Dam by the Metropolitan District Commission. Furthermore, these various schemes for Section 1 include the layout for the ramps serving the Inner Belt, as proposed by the North Terminal Area Study, which this report recommends not being built in the initial construction. It should be noted that the Department of Public Works is not directly responsible for the construction of any of the arterial streets mentioned above, and therefore it is not within the scope of this report to present any conclusions as to which of the various layouts presented may be more or less advantageous than any of the other schemes presented. These conclusions may be reached only by the respective agencies having responsibility for their construction.

The design criteria used in the design of these arterial streets is such that they will

Schemes Studied (Continued)

efficiently carry the traffic assigned thereto. Furthermore, the roadways have been designed to reflect minimum cost of construction although no estimates of cost are included. The surface arterials are designed on the assumption that the Boston & Maine Railroad yards, with the exception of a connection to the Hoosac Pier, will be totally eliminated.

A connection has been provided to the arterial streets at City Square so that the Boston Sand & Gravel Company will maintain its present access to city streets in that location. However, no access has been provided in the vicinity of Prison Point Bridge since the Interstate Highway does not interfere with the present access. It should be noted that the MBTA tracks as presently proposed would cut off this access to the city streets.

SECTIONS 2 and 3

Two basic locations were considered between Prison Point Bridge and the interchange with I-93, one location along the ladder tracks which serves the industries fronting on Rutherford Avenue, and one location which passes westerly of the three new industrial buildings within the yard and follows a location parallel with the mainline tracks.

Each of these two locations has been laid out in conjunction with the location of I-695 extending westerly towards Cambridge, which also could be either one of two locations: (1) northerly of the yard itself along the northerly edge of the railroad yard and southerly of the industries which front on Washington Street in Somerville, and (2) through the railroad classification yard.

Scheme I follows a location along the ladder tracks and thence along the northerly edge of the yards to Joy Street. (Plan 1"=100' submitted, not bound herein)

Scheme II is located westerly of the new industries within the yard and along the

Schemes Studied (Continued)

mainline tracks with the Inner Belt to Cambridge passing along the northerly edge of the yard to Joy Street. (Plan 1"=100' submitted, not bound herein)

Scheme III follows a location along the ladder tracks and thence through the middle of the classification yard to Joy Street. (Plan 1"=400' herein)

Scheme IV is located westerly of the new industries within the yard and along the mainline tracks, thence through the middle of the classification yard to Joy Street. For both Schemes III and IV through the classification yard, 1-695 would be constructed as a two-level viaduct structure in an attempt to minimize the effect on the yard as much as possible. (Plan 1"=400' herein)

Scheme V is located westerly of the new industries within the yard and along the mainline tracks and thence through the classification yard to Joy Street with a layout through the classification yard such that the expressway would be single-level construction and the profile would be brought as close to existing grade as possible, consistent with design criteria, in order to minimize the cost of construction by minimizing the amount of viaduct required, and utilizing earth embankment construction where feasible. (Plan 1"=100' submitted, not bound herein)

Scheme VI follows a location along the ladder tracks and thence through the classification yard to Joy Street with a layout similar to Scheme V. (Plan 1"=100' submitted, not bound herein)

SECTION 1-A

Section 1-A includes the area extending northeasterly from City Square in Charlestown approximately 2,500 feet along the location of Mystic River Bridge to a point beyond Bunker Hill Street. This section was added to the scope of contract subsequent to commencing work on the studies and resulted from legislation authorizing the Massachusetts Port Authority and the Metropolitan District Commission to construct an arterial connection from Leverett Circle to the Mystic River Bridge.

In order that this arterial connection may be made to the Mystic River Bridge, the existing ramps providing service to the Mystic River Bridge and the Fitzgerald Expressway must be revised. The section of the Interstate System at the juncture of the Mystic River Bridge and the Fitzgerald Expressway does not meet design criteria for the Interstate System, and all revisions to the Interstate System and the arterial streets at this point must be designed in such a manner so as not to preclude the future possibility of a reconstruction of the Interstate System to meet the established design criteria. Six schemes have been developed, all of which (1) provide for an arterial connection from Leverett Circle to the Mystic River Bridge; (2) provide two pairs of ramps to replace the existing ramp service at this point on the Expressway System; (3) provide varying degrees of compliance with the design criteria for the Expressway.

Scheme I provides for extensive reconstruction of I-95 and improves the horizontal and vertical alignment so that the design speed, now 25 miles per hour, is increased to 50 miles per hour. In order to achieve this condition, however, the ramp service must be located northerly of the City Square area so that weaving distances can be made compatible with design speed.

Scheme II provides much less extensive reconstruction of the existing structures and would provide a design speed of 45 miles an hour for southbound traffic and 40 miles an hour for northbound traffic. The ramp service would be located similar to that for Scheme I.

Scheme III does not change the structure of the southbound roadway which, due to the vertical alignment, provides only 25 miles an hour design speed. It provides for the reconstruction of the northbound roadway for that portion that is not on viaduct and would raise the design speed from 25 miles an hour to 40 miles an hour. The ramp service has been moved slightly to the south so that service to and from the south may utilize Bunker Hill Street. However, this scheme would require taking the Commandant's house in the Navy Yard.

Scheme IV provides for the same reconstruction of the northbound and southbound roadways as does Scheme II. However, the ramp service is moved southerly as in Scheme III so that the service to and from the south may utilize Bunker Hill Street. This scheme would also take the Commandant's house.

Scheme V is very similar to Scheme III except the Commandant's quarters would be saved.

Scheme VI is similar to Scheme V except the ramp service on the easterly side requires weaving on the frontage road (i.e., not scissored).

After consultation with the various agencies involved, a report will be made on the cost of reconstruction of the Interstate System in Section I-A and the advantages and disadvantages of the various schemes. Since each of the six schemes provides complete ramp service, and the construction is physically independent of the design in the vicinity of City Square and Rutherford Avenue, the question as to which scheme may be selected is not a factor in the design of I-695.

SCHEMES ELIMINATED

Schemes III and IV in Sections 2 and 3 were eliminated from further consideration since they afford no advantage over the location along the northerly edge of the yard as provided in Schemes I and II, and a material disadvantage results in a location through the classification yard explained as follows:

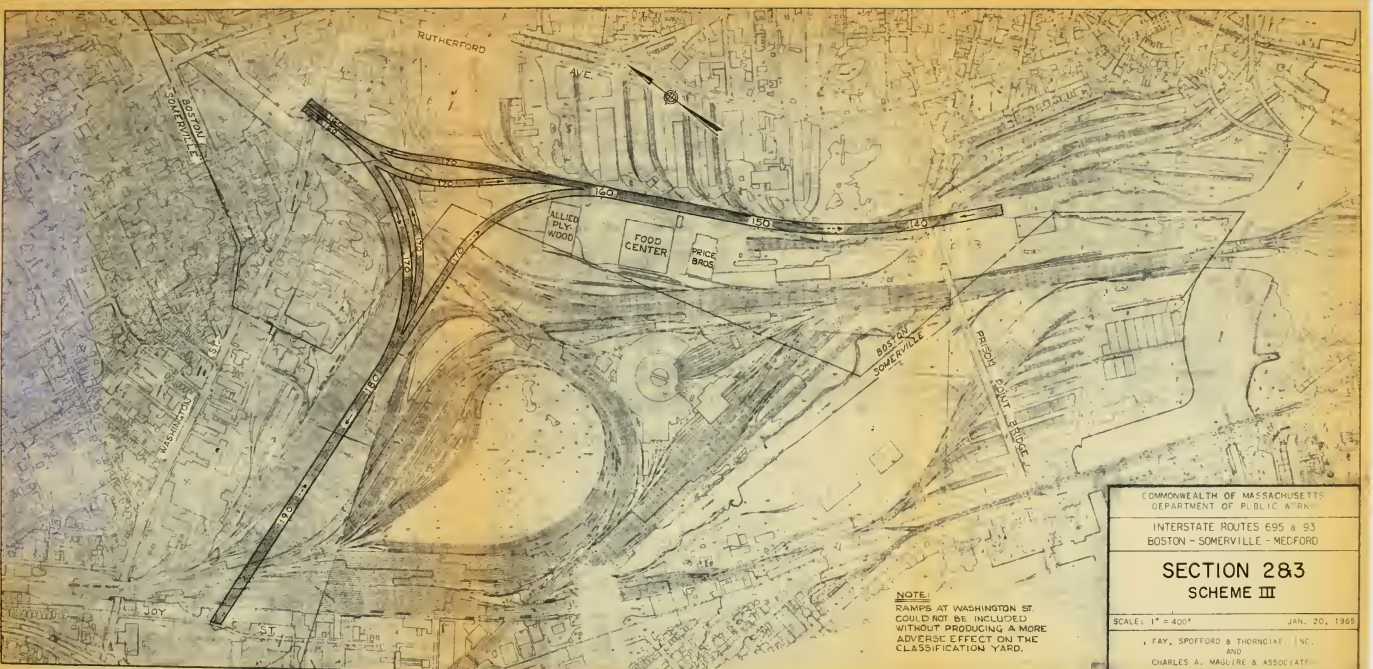
The classification yard of the Boston & Maine Railroad is divided into two main areas, the incoming and the outgoing classification yard. It is in this yard that all Boston & Maine freight trains are either made up or broken down as the case may be. The tracks are closely spaced varying between twelve and fourteen feet on centers, which gives insufficient clearance to place columns to support an overhead viaduct structure without removal of one track for each column. The layout of the tracks in this yard is not such that the columns could be oriented to take out only one track for each line of columns. It would be impractical to achieve a layout which would eliminate less than six tracks. Tracks taken at the entrance throat or exit require the loss of additional trackage in order to relocate the switches.

Furthermore, the operation of the yard depends upon a line of sight observation of the entire yard for the control of switches and retarding mechanisms which are operated from various control towers, making the operation of the yard automatic from the standpoint that cars may be shunted off to various tracks and stopped at any desired location by the operators in the control towers.

An elevated expressway through this yard would seriously impair the line of sight observation of the yard from the control towers. There are no alignment advantages for those schemes passing through the center of the classification yard over other lines presented.

Schemes Eliminated (Continued)

There is no advantage in the cost of construction of the Inner Belt on a viaduct through the middle of this classification yard. In fact, the cost of construction of a viaduct would be somewhat higher than the location along the north edge of the yard. In order to lay out the bents and the columns through the yard an effort would be made to save as many tracks as possible, thereby utilizing longer longitudinal spans between bents and greater transverse spans between columns in order to keep the columns in a location affecting common tracks.



NOTE:
RAMPS AT WASHINGTON ST.
COULD NOT BE INCLUDED
WITHOUT PRODUCING A MORE
ADVERSE EFFECT ON THE
CLASSIFICATION YARD.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

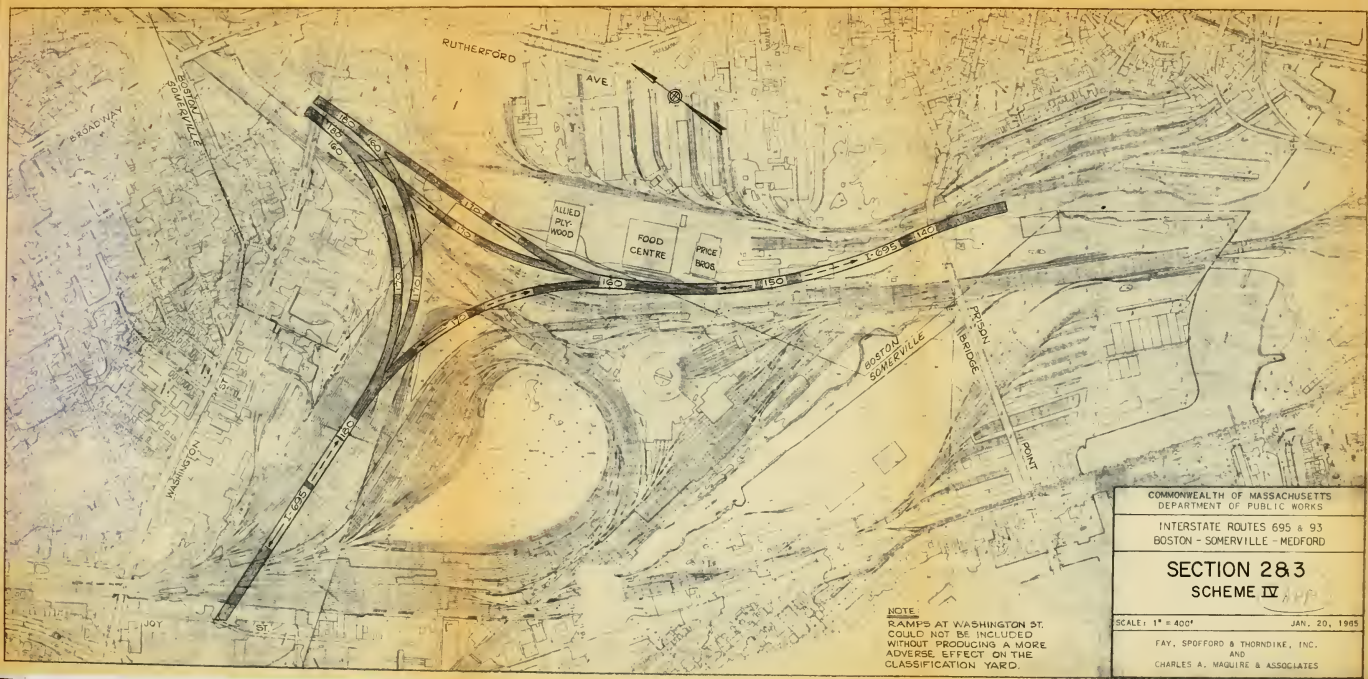
INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 283
SCHEME III

SCALE: 1" = 400' JAN. 20, 1965

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AND
CHARLES A. MAGUIRE & ASSOCIATES





COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 283 SCHEME IV

SCALE: 1" = 400' JAN. 20, 1965

FAY, SPOFFORD & THORNDIKE, INC.
AND
CHARLES A. MAGUIRE & ASSOCIATES

NOTE
RAMPS AT WASHINGTON ST.
COULD NOT BE INCLUDED
WITHOUT PRODUCING A MORE
ADVERSE EFFECT ON THE
CLASSIFICATION YARD.



TRAFFIC SERVICE

Since most of the expressway included within Part I of this Report is within the Boston & Maine Railroad yard, it is rather inaccessible to the street system and, therefore, becomes rather difficult and expensive to provide ramps for local access. However, an analysis of the assignments made to the Expressway System will show that the desires can be satisfied best by the ramp service as recommended.

Since the two major interchanges with I-93 and I-95 are relatively close (approximately 3,600 feet) the operational efficiency of the Expressway System would be seriously impaired if ramp service were provided at Prison Point Bridge. The weaving movements introduced by such a location of ramps, while within the theoretical limitations of design, would in practice cause conflicts and loss of efficiency of operation based on observations and experience of operation of existing expressways. Furthermore, the improvement of Rutherford Avenue as an arterial street connection between City Square and Sullivan Square would serve as a collector-distributor in Charlestown for the Expressway System and would have the further advantage of delivering the traffic to a point beyond these two major interchanges so that traffic would have access to the Expressway System beyond the interchanges rather than through the interchanges.

The only ramp service recommended for the section of the Inner Belt between City Square and Joy Street is the pair of ramps to and from the west from Washington Street in Somerville. Not only does this location satisfy the above-mentioned desire not to have any more traffic than necessary funneled through the major interchanges, but it is the only service for the Expressway System to the west for a large portion of Charlestown, East

Traffic Service (Continued)

Somerville and Everett. Similar service is not available to the west except in the vicinity of Cambridge Street in Cambridge.

The studies made in Section 1-A include revisions to the ramp locations for that section of I-95 in Charlestown. These studies were all predicated on improving the substandard horizontal and vertical alignment of the Expressway System in this vicinity.

PROJECT COSTS

The total project costs include the cost of construction, right-of-way costs, railroad force account work, and miscellaneous costs such as engineering, and demolition of structures within the right-of-way. The construction costs developed for each of the various schemes herein were obtained by developing preliminary estimates of the quantities of the various items which would have to be incorporated into the work, and unit costs were then applied to these quantities. The unit costs which were used to develop the construction costs reflect the nature of the work and its location in a heavily built-up urban area. The construction costs include all work indicated on the plans which must be performed to provide a complete facility and include the cost of all ramps, frontage roads, local street improvements, and the relocation of all municipal utilities made necessary by the expressway.

The right-of-way costs are the total costs to acquire all properties within the proposed highway layout lines. These costs are based on fairmarket values and include miscellaneous costs such as appraisal fees, conveyance costs, and relocation costs. Right-of-way costs were furnished by the Department of Public Works for each of the schemes included herein. Railroad force account work includes all work which must be performed in order to relocate or replace railroad tracks, signal equipment, or other railroad facilities.

The demolition costs include all costs necessary to clear the right-of-way of existing above-ground structures. The cost of engineering and contingencies was computed at 15% of the total cost of construction, such allowance would allow approximately 5% for contingencies and 10% for engineering design and supervision.

Construction costs are presented for each scheme in each section and are further subdivided into the major categories of construction as follows:

Project Costs (Continued)

STRUCTURES: Viaduct, bridges, retaining walls, waterproofed depressed sections, culverts, tunnels, and appurtenant work.

EARTHWORK: Rock, bridge and roadway excavation, and ordinary and gravel borrow.

PAVEMENT: Sub-base, surfacing, roadway drainage, and loaming and seeding.

UTILITY RELOCATION: Relocation and alteration of all publicly owned utilities, and surface drains required by the expressway construction.

MISCELLANEOUS: All curbing, guard rails, lighting, signs, landscaping, and any special problems.

The costs estimated for Section 1 do not include any costs associated with the arterial streets which are shown on the plans. Costs have not been estimated for Section 1-A.

INNER BELT - I-695
PROJECT COSTS

In Thousands of Dollars

Section Number	Construction Costs						Railroad Force Account	Construction Cost Plus Force Account	Engineering and Contingencies	Right-of-Way Costs	Total Costs
	Structures	Earthwork	Pavement	Utility Relocation	Miscellaneous	Total Construction Cost					
SCHEME I											
1*	5,340	--	--	150	47	5,537	1,883	7,420	830	325	8,575
2 & 3	23,175	47	54	200	466	23,942	1,470	25,412	3,591	2,175	31,178
Totals	28,515	47	54	350	513	29,479	3,353	32,832	4,421	2,500	39,753
SCHEME II											
1*	5,340	--	--	150	47	5,537	1,883	7,420	830	325	8,575
2 & 3	23,224	47	54	200	475	24,000	1,970	25,970	3,600	2,525	32,095
Totals	28,564	47	54	350	522	29,537	3,853	33,390	4,430	2,850	40,670
SCHEME V											
1*	5,340	--	--	150	47	5,537	1,883	7,420	830	325	8,575
2 & 3	18,180	1,089	221	200	396	20,086	1,374	21,460	3,013	4,025	28,498
Totals	23,520	1,089	221	350	443	25,623	3,257	28,880	3,843	4,350	37,073
SCHEME VI											
1*	5,340	--	--	150	47	5,537	1,883	7,420	830	325	8,575
2 & 3	18,405	976	201	200	393	20,175	874	21,049	3,157	3,675	27,881
Totals	23,745	976	201	350	440	25,712	2,757	28,469	3,987	4,000	36,456

*Contract "F"

PHYSICAL EFFECTS

All buildings or sheds, presently located beneath the viaduct, would have to be relocated since policy does not permit private construction to remain within the interstate layout line. Only seven properties are affected in Sections 1, 2 and 3, these being those properties located between Washington Street and the northerly edge of the classification yard where the ramps come to grade and connect to Washington Street. The balance of the expressway location is within the Boston & Maine Railroad yards, and estimates have been included to revise or replace all railroad facilities which have been affected by the Interstate System.

There are several industries between Washington Street and the railroad yards which are partially affected by the expressway and would lose some portion of their facilities, the exact amount of which would be subject to change after consultation with the various property owners affected to ascertain the relative importance of each of the structures which might be affected and whether or not it could be conveniently located elsewhere within the limits of their existing property.

A table of physical effects was not developed since only seven properties under Schemes I and II and six properties under Schemes V and VI would be taken either in their entirety or partially affected.

SUMMARY OF ADVANTAGES AND DISADVANTAGES

The location of Interstate Route 695 in Sections 1, 2 and 3 is basically the same for all schemes. The major difference in location occurs between Prison Point Bridge and Cambridge Street at the northerly edge of the Boston & Maine yards.

All schemes provide similar alignment conditions and the ramp service is identical for all schemes. Schemes V and VI between the interchange with Interstate Route 93 and Joy Street in Cambridge are somewhat different than the other two schemes since the classification yard would be eliminated by this scheme. However, while there may be considerable differential in the costs of construction there is only a slight difference in total project costs.

Scheme I - Advantages

The primary advantage of Scheme I is that it results in the least effect on railroad facilities and property. The location along the ladder track would result in the saving in railroad force account work of approximately \$500,000. The right-of-way cost for this location would be \$350,000 less than Scheme II. The net saving in total cost due to all factors compared to Scheme II would be approximately \$900,000.

Scheme I - Disadvantages

1. The horizontal alignment of the interchange with I-93 does not provide transition curves and therefore does not satisfy the horizontal criteria to the extent of Scheme II.
2. Scheme I would require the taking of the Hood Milk Company buildings at Cambridge Street, the value of which is included in the right-of-way costs.

Summary of Advantages and Disadvantages (Continued)

3. Scheme I would bisect an area which the Boston Redevelopment Authority has selected for the site of the Community College. In so doing, it would render the site unacceptable for use as a college campus since it would not allow the development of an integrated site. A double-deck viaduct structure with the upper roadway some 70 feet above the level of the ground passing through a college campus is something that positively could not be tolerated.

4. Northerly of the Community College site the location along the ladder tracks would split an area which is developed for industry on both sides of the proposed two-level viaduct structure. In this location Interstate Route 695 would have an adverse effect on the three industrial facilities to the south of this location, since they would tend to be separated from the contiguous industrial areas fronting on Rutherford Avenue.

Scheme II - Advantages

1. Scheme II results in the best horizontal layout of the expressway since all horizontal curves in the interchange are laid out with transitions, although the layout still does not fully satisfy recommended design criteria in that full transitions cannot be obtained.

2. Scheme II passes along the perimeter of the Community College site and would in no way interfere with the development of the site, and the academic buildings could then be planned so as not to be influenced by the viaduct structure.

3. Scheme II would pass southerly of the industrial area parallel to the railroad tracks, which in effect would combine the three transportation arteries through Charlestown, which will allow greater flexibility of its redevelopment. The Boston Redevelopment Authority feels very strongly on this point and insists that this location is the only one which would be compatible with their plans for urban renewal.

Summary of Advantages and Disadvantages (Continued)

4. By paralleling the mainline railroad tracks, which are proposed to be utilized by the MBTA rapid transit extension, three transportation facilities (railroad - rapid transit - expressway) would be combined in one corridor, thereby offering the greatest flexibility in development and utilization of abutting areas with minimum interruption by the transportation facilities. Furthermore, since the MBTA extension for the most part would utilize existing railroad tracks it results in a minimum conflict between the separate transportation facilities.

Scheme II - Disadvantages

Scheme II results in the highest total cost due to the construction costs and railroad force account. Its total cost exceeds Scheme I by \$900,000.

Scheme V - Advantages

The primary advantage of Scheme V is its construction cost, which is approximately \$4,000,000 less than Scheme I or Scheme II, and its total project cost which is \$3,600,000 less than Scheme II.

Scheme V - Disadvantages

1. By far the major disadvantage of Scheme V is the fact that it would require the taking of the entire outbound freight classification yard of the Boston & Maine Railroad. While the economic value of this taking has been included in the right-of-way costs, the fact is that this yard could be vital to the railroad's freight operation and presently is a very integral part of the entire yard. Therefore it is extremely likely that the total cost of acquisition would include a severance damage, the amount of which is not included in the cost of acquisition as reported herein. The amount of this severance damage would be very difficult to ascertain and could vary from a relatively small amount to an amount in excess

of that presently carried as the economic value of the taking. Furthermore, the railroad may not be able to cease its use of the classification yard until it has been replaced elsewhere, which could cause some time delay in the construction of the expressway through the yard.

2. Scheme V requires the MBTA extension to be depressed under the New York Central Railroad track to Mystic Pier. The MBTA estimates the cost of depressing their track under the railroad to be \$2,000,000 in excess of the cost of the bridge over the track, which is now included in their cost of extending the rapid transit line. This \$2,000,000 should be included as a direct cost of Scheme V but is now now included in the estimates.

3. Scheme V results in a sag in the profile in order to produce the most favorable conditions effecting cost of construction and requires traffic in each direction to negotiate a 1,400 foot 3% grade.

4. The crossing of Joy Street by this scheme is single level, while Schemes I and II are two level. Should a two-level crossing be required by alignment considerations southerly of Joy Street, it would reduce the cost differential and could negate the scheme.

Scheme VI

Scheme VI has the same advantages and disadvantages relative to Scheme I and Scheme II as does Scheme V with the following additional disadvantages:

1. Scheme VI would bisect an area which the Boston Redevelopment Authority has selected for the site of the Community College. In so doing, it would render the site unacceptable for use as a college campus since it would not allow the development of an integrated site. A double-deck viaduct

structure with the upper roadway some 70 feet above the level of the ground passing through a college campus is something that positively could not be tolerated.

2. Northerly of the Community College site the location along the ladder tracks would split an area which is developed for industry on both sides of the proposed two-level viaduct structure. In this location Interstate Route 695 would have an adverse effect on the three industrial facilities to the south of this location, since they would tend to be separated from the contiguous industrial areas fronting on Rutherford Avenue.

PART II

INTERSTATE ROUTE 93

CAMBRIDGE STREET, CHARLESTOWN
TO
MYSTIC VALLEY PARKWAY, MEDFORD

GENERAL DESCRIPTION OF STUDY AREA

The geographical limits of the portion of Interstate Route 93 (I-93) covered by Part II of this Report are the end of the present construction at a point just southeast of the Mystic Valley Parkway in Medford and a point immediately north of Cambridge Street in the Charlestown section of Boston and just east of the main line tracks of the Boston & Maine Railroad. The portion of I-93 that will extend southerly of this latter control point to an interchange with the Inner Belt (I-695) in the Boston & Maine Railroad yards is included in Part I. Between the above limits the proposed location of I-93 is approximately as recommended in the Inner Belt Report, 1962. South of the present end of construction of I-93, the expressway will cross the Mystic River and the M. D. C. Reservation to Mystic Avenue which it parallels on the north side through the Ten Hills section to the Fellsway; it will then cross and run parallel to Mystic Avenue on the south side as it continues east, crossing Broadway just east of the Boston-Somerville city line. I-93 will then cross to the east of the main line Boston & Maine Railroad tracks and turn south to parallel the tracks to a point just north of

Cambridge Street, Charlestown, which is the limit of Part II of this Report. With the exception of the portion in the Mystic River Reservation, the route is located through heavily built up and congested residential and commercial areas of Somerville. The route crosses a major arterial parkway (the Fellsway) and two major streets, Mystic Avenue and Broadway.

This general location has the advantage of being the most direct route through Somerville which will best serve local desires by providing readily accessible ramp connections to the streets, and which will result in a minimum cost of construction. The major disadvantage of this location is the number of families displaced in the East Somerville area, and this factor was ever present in the development of the various schemes as contained herein. Effort has been made to hold right-of-way acquisitions to a minimum consistent with the requirement that ramp services must be provided in the Somerville area in order for the expressway system to properly serve its function in this section of the metropolitan area.

SCHEMES STUDIED

The study of Route 93 in Somerville has been divided into two sections, Section 4 and Section 5, with the separation line just to the west of the Fellsway. Several different designs or schemes have been considered for the exact location and details of I-93 in each of the two sections. Those schemes which appeared to be promising were developed more fully with cost estimates and a list of their advantages and disadvantages. These schemes were drawn at a scale of 1"=100' and are shown on plans submitted with this Report but not bound with it. Those schemes which contained definite and obvious disadvantages in comparison to other schemes studied were discarded and they are included in this Report at a scale of 1"=400'.

SECTION 4

There are two basic arrangements for Section 4. In one, I-93 crosses under the Fellsway in a depressed section; in the other, it crosses over the Fellsway and Mystic Avenue on viaduct. South of the crossing of Mystic Avenue all schemes indicate a highway mostly on earth fill running easterly through East Somerville with some cut necessary through the high ground at Nunnery Hill just before crossing Broadway. All schemes require that the existing Mystic Avenue which is north of and parallel to this section of the expressway be used for westbound traffic. A new frontage road on the south side of the expressway provides

for the eastbound traffic now handled on Mystic Avenue and picks up local traffic from streets cut off by the proposed I-93. The many schemes studied are all variations of the two basic arrangements described above; the variations are chiefly in the location of ramps and in the amount of property required for right-of-way.

Scheme I takes a considerable amount of property since retaining walls are not utilized to contain the side slopes. Full ramp service is provided to serve I-93 in both directions. The ramps serving traffic to the south are located at the easterly end of this section, and ramps serving the north are located in the westerly end of this section. (Plan at 1"=400' herein)

Scheme II is basically the same as Scheme I except that Broadway westbound is separated from Mystic Avenue eastbound by a bridge over Mystic Avenue relocated. (Plan at 1"=400' herein)

Scheme III is basically the same as Scheme II except that Broadway westbound is located under Mystic Avenue eastbound. (Plan at 1"=400' herein)

Scheme III-A is very similar to Scheme I with the addition of a direct ramp from the north off-bound to Sullivan Square. This scheme would require more property than Scheme I. (Plan at 1"=400' herein)

Scheme IV is the same as Scheme I except I-93 crosses under Mystic Avenue and the Fellsway in a depressed section to meet a depressed scheme (Scheme IV) for Section 5. (Plans at 1"=100' submitted not bound herein)

Schemes Studied - Section 4 (Cont'd)

Scheme V is basically the same as Scheme I except that the plan and type of construction is such as to reduce the amount of property taken to a minimum. Also shown on Scheme V is an alternate providing a grade separation of westbound Broadway and eastbound Mystic Avenue similar to Scheme II. (Plan at 1"=400' herein)

Scheme VI-A is basically the same as Scheme V except both sets of ramps are located near the intersection of the expressway with the Fellsway and the ramps serving traffic to the expressway south are located so as to provide direct connection to and from the Fellsway north. An underpass of the intersection of the Fellsway and Mystic Avenue is provided for the traffic from the expressway and the Fellsway south to make a direct connection to the southbound on-ramp. (Plan at 1"=400' herein)

Scheme VI-B is the same as Scheme VI-A except the depressed ramp serving traffic from the Fellsway south to I-93 south is eliminated requiring that this traffic cross Mystic Avenue west and the Fellsway north at grade. (Plan at 1"=400' herein)

Scheme VII is also similar to Scheme I except that the location of each pair of ramps is inverted so that the ramps serving I-93 to the south are located at the westerly end so that they connect more or less directly with the Fellsway, and the ramps serving I-93 to the north are located so as to provide direct connections with the Sullivan Square interchange. (Plan at 1"=400' herein)

Scheme VIII is the same as Scheme VI-A except that the underpass of the intersection of the Fellsway serves both traffic destined for the southbound on-ramp as well as local traffic bound for Charlestown and East Somerville. (Plan at 1"=100' submitted not bound herein)

Scheme IX is very similar to Scheme VI-B with all movements at the Fellsway intersection taking place at grade except that the layout of the intersection has been modified so that it will handle the various movements far more effectively than does Scheme VI-B. (Plan at 1"=100' submitted not bound herein)

Scheme X is identical to Scheme VIII for the expressway and ramps. However, the intersection between Fellsway-McGrath Highway and Mystic Avenue provides for a grade separation so that both north and southbound McGrath-Fellsway roadway is depressed under Mystic Avenue. (Plan at 1"=400' herein)

Scheme XI is very similar to Scheme X except that only the northbound McGrath-Fellsway roadway is depressed under Mystic Avenue, and the southbound Fellsway-McGrath roadway is at the present existing grade of the intersection. (Plan at 1"=100' submitted not bound herein)

SECTION 5

Scheme I is based on a profile which is elevated above the city streets. Typically, the expressway is on a fill section which utilizes retaining walls, where necessary, to confine the fill in order to conserve property. Ramps to and from the north are located in the vicinity of Shore Drive, and with the ramps so located Bailey Road is utilized for westbound Mystic Avenue and the present Mystic Avenue is utilized for eastbound traffic. (Plan at 1"=400' herein)

Scheme II is essentially the same as Scheme I and the salient feature is that I-93 is so located that all the homes fronting on the southerly side of Bailey Road are retained and full height walls are utilized to retain the fill in the much narrower space available for the highway. (Plan at 1"=400' herein)

Scheme III is essentially the same as Scheme II except that a two-level viaduct is used between the Fellsway and Shore Drive in order to conserve property taking, and all the homes on the southwest side of Bailey Road are retained. (Plan at 1"=400' herein)

Scheme IV is based on a profile which is depressed below the city street level and necessitates filling in much of the Mystic River Basin. The expressway passes under Shore Drive and is held down in the river crossing in order to accommodate the ramps to Mystic Avenue. In this scheme the expressway continues easterly as a depressed roadway until

it passes beneath Mystic Avenue where it then ascends to a point in

Section 4 which connects with Scheme IV of Section 4. (Plan at

1"=100' submitted not bound herein)

Scheme V is based on a profile above the city streets with viaduct construction over the Mystic River Basin. However, the ramps are located on the westerly side of the Mystic River, and the traffic circulation pattern in the vicinity of the Ten Hills section does not utilize Bailey Road as a heavily traveled frontage road. This scheme requires that Mystic Avenue be widened to handle two-way traffic.

(Plan at 1"=400' herein)

Scheme VI is the same as Scheme V except for the layout of the ramps in Medford. (Plan at 1"=400' herein)

Scheme VII. This number was not used.

Scheme VIII. is almost identical with Scheme VI except that the profile of the viaduct section over the Mystic River is two feet higher to allow a minimum clearance of 20 feet over the water as required by the Metropolitan District Commission. (Plan 1"=100' submitted not bound herein)

Scheme IX is very similar to Scheme VI except that it is predicated on a fill construction over the Mystic River Basin. The main roadway profile is lowered and the westbound ramp passes over I-93 to effect maximum economy in the construction of the embankment. (Plan 1"=100' submitted not bound herein)

SCHEMES ELIMINATED

The following schemes for each of the two sections were eliminated from further consideration for the reasons indicated.

SECTION 4

Schemes I, II, III, III-A and V were developed early in the process of preparing the various studies, and all contain two basic disadvantages: (1) the ramp locations do not effectively handle the traffic since they cause considerable weaving on the southbound frontage road and Mystic Avenue, which in turn requires these roadways to be wider than in the case of those schemes which do not require this weaving, and (2) more property is taken by these schemes than those developed later. Furthermore, the advantages of these schemes have been incorporated in later schemes.

Scheme VI-A contains no material advantage over Scheme VIII, and since Scheme VIII more effectively handles the local traffic at the intersection of the Fellsway and Mystic Avenue, Scheme VI-A is eliminated from further consideration.

Scheme VI-B is eliminated from further consideration in favor of Scheme IX with which it is very similar, except that the latter has an improved layout of the at-grade intersection which will more effectively handle the traffic with no material increase in cost of construction.

Scheme VII would require all weaving induced by on and off ramps to take place on the expressway, and also would require more

property to be taken than for Schemes VIII and IX with both sets of ramps located near the Fellsway.

Scheme X has only slight advantage in handling traffic over Scheme XI but is eliminated because its cost is over \$1,300,000 more than Scheme XI and would require an additional taking of 8,000 s.f. of Foss Park.

SECTION 5

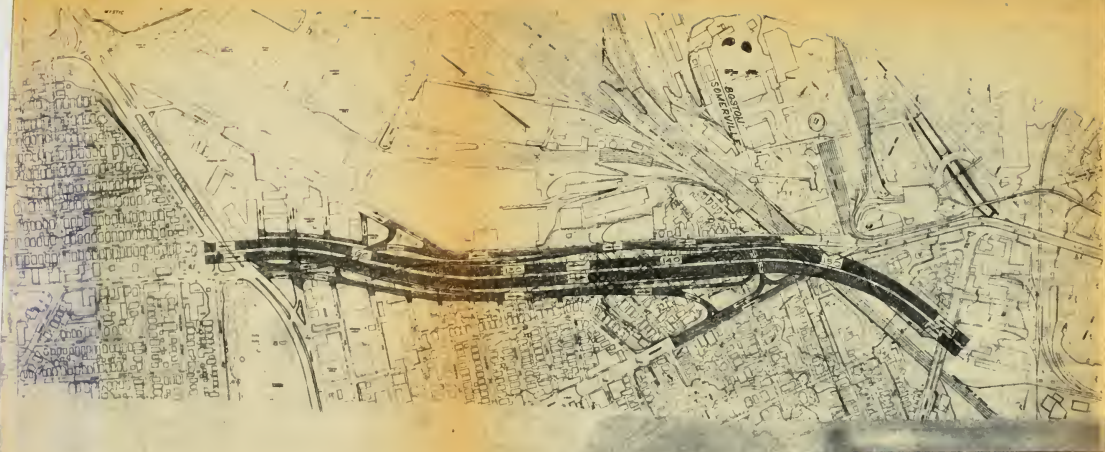
Scheme I - The increased volume of traffic on Bailey Road and its one-way character would have a detrimental effect on all the properties fronting on the northeast side of Bailey Road and thereby negate any advantages which may result in retaining these homes. Furthermore, such a traffic pattern would require one-way traffic on Shore Drive which would further accentuate the separation of the Ten Hills Section from the rest of Somerville; whereas other schemes retain the existing traffic pattern on the local streets, thus making invalid the objection that the expressway separates the Ten Hills section from Somerville proper. A new one-way traffic pattern would also result in a disadvantageous situation since it would not be continuous; that is, the one-way pattern must revert to a two-way pattern west of Shore Drive and at the Fellsway. The one-way pattern on Bailey Road and Mystic Avenue would impose a severe disadvantage on Medford traffic desiring to use the ramps.

Scheme II - Scheme II has the advantage that the row of homes fronting on Bailey Road are retained. However, these homes are so close to the expressway and the height of the expressway is such that the value of these properties for residential purposes would be seriously impaired, and there would be no real advantage in retaining them.

Scheme III - Scheme III has the same disadvantage as Scheme II but they are further accentuated because the second level is above the tops of the adjacent houses. Furthermore, the long ramps required to reach the upper level would actually increase property takings elsewhere.

Scheme V - Scheme V differs from Scheme VI only in the configuration of the ramps. The ramp layout of Scheme VI handles the traffic more efficiently than Scheme V; therefore, Scheme V is eliminated from further consideration.

Scheme VI - Scheme VI differs from Scheme VIII only in the height of the profile over the Mystic River Basin (it being 2 feet less). Since Scheme VI does not provide the minimum clearance required by the Metropolitan District Commission, Scheme VI is eliminated from further consideration.



COMMISSIONER OF HIGHWAYS
DEPARTMENT OF PUBLIC WORKS

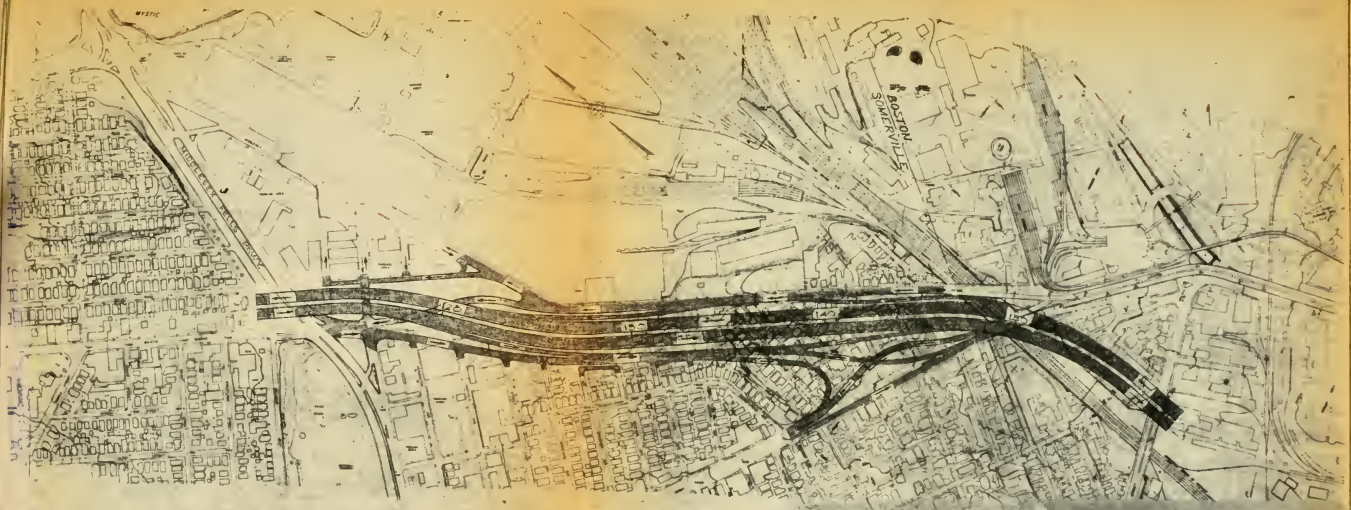
INTERSTATE ROUTE 65 + 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 4 SCHEME I

SCALE 1" = 400' AUG. 28, 1964

FAY, SPOFFORD & THORNDIKE, INC.
AND
CHARLES A. MANNING & ASSOCIATES





COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 4 SCHEME II

SCALE: 1" = 400'

AUG. 28, 1962

FAY, SPOFFORD & THORNDIKE, INC.
AND
CHARLES A. MAGUIRE & ASSOCIATES



COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

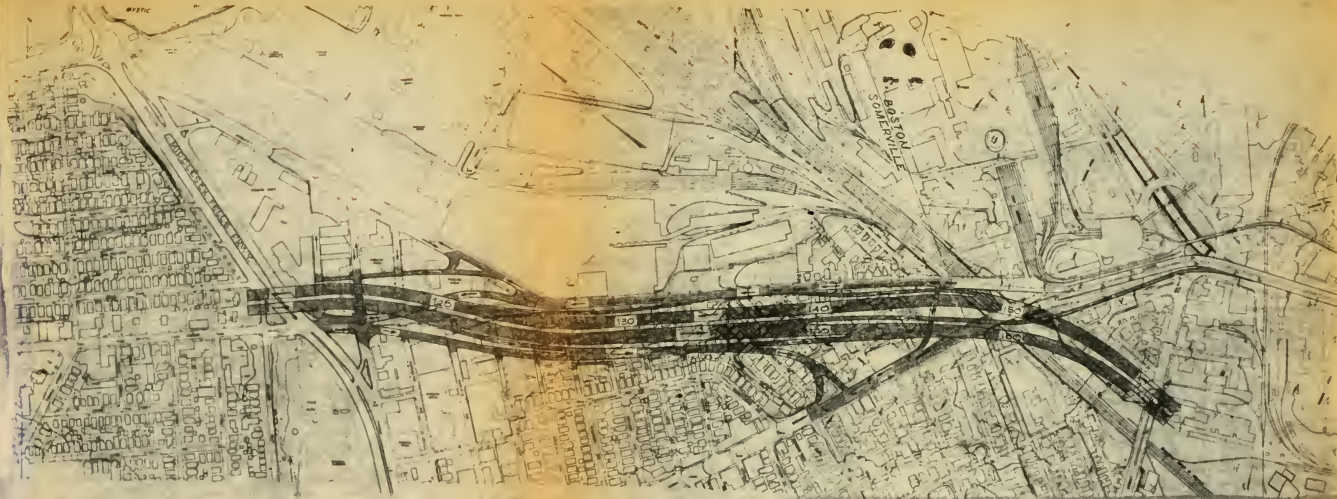
INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 4 SCHEME III

SCALE: 1" = 400'

AUG. 28, 1964

FAY, SPOFFORD & THORNDIKE, INC.
AND
CHARLES A. MAGLIRE & ASSOCIATES



COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 4 SCHEME IIIA

SCALE: 1" = 400'

AUG. 28, 1964

FAY, SPOFFORD & THORNDIKE, INC.
AND
CHARLES A. MAGUIRE & ASSOCIATES



COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TRANSPORTATION

INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

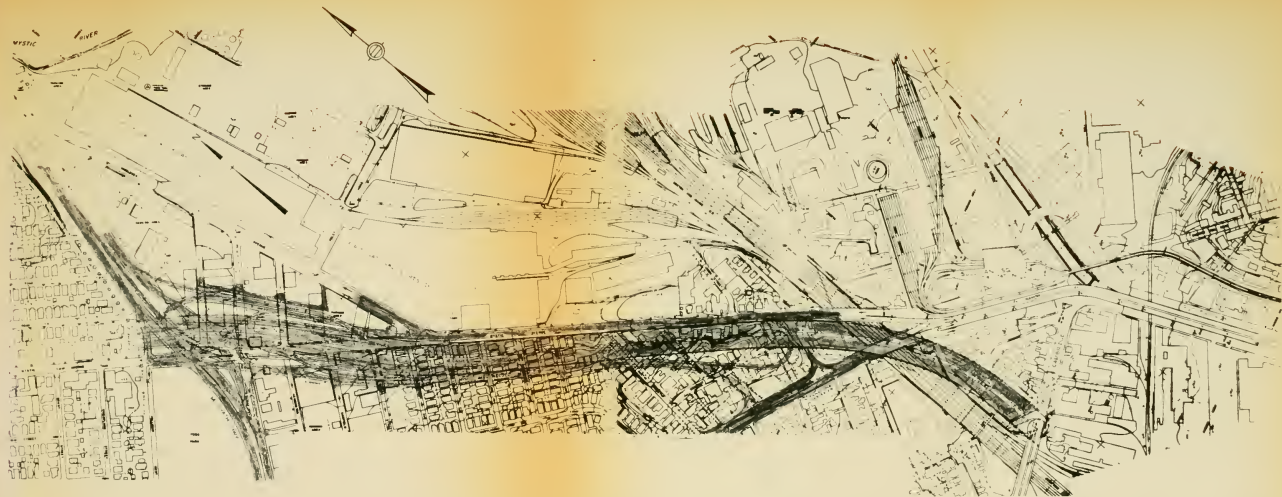
SECTION 4 SCHEME V

SCALE: 1" = 400'

FAY, SEFTON & LITTLE, INC.,
200

HAMILTON, HARRINGTON & HARRINGTON, INC.





COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF PUBLIC WORKS

INTERSTATE ROUTES 695 & 97
BOSTON - SOMERVILLE - MEDFORD

SECTION 4 SCHEME VI A

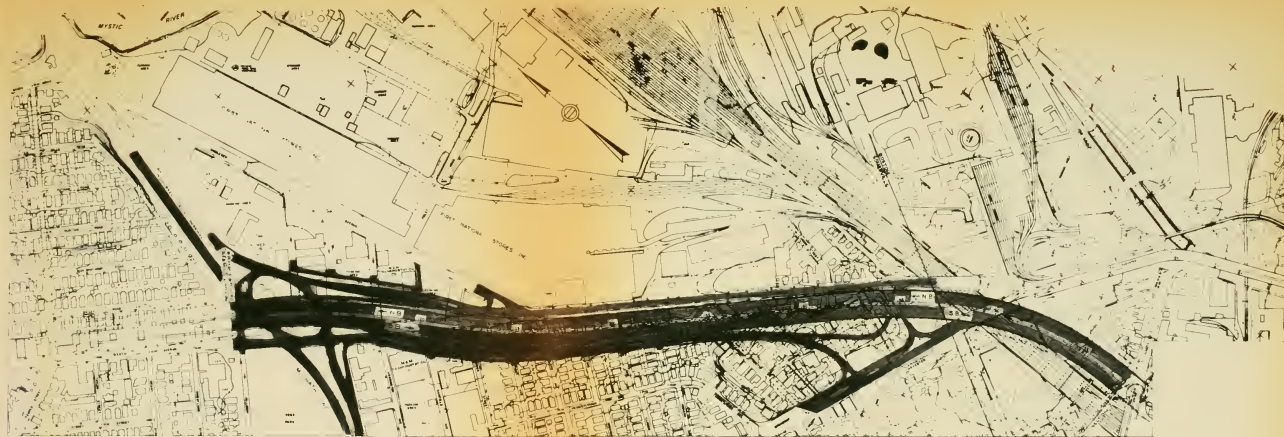
SCALE: 1" = 400' (1" = 100m)

DATE: 1964-10-10

400

1" = 400' (1" = 100m)





COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 4 SCHEME VI B

1/4" = 1" - 4' 0"

AS SHOWN

JAY SPELBERG & THORNDIKE, INC.

ARCH

CHARLES A. HAMMILL & ASSOCIATES



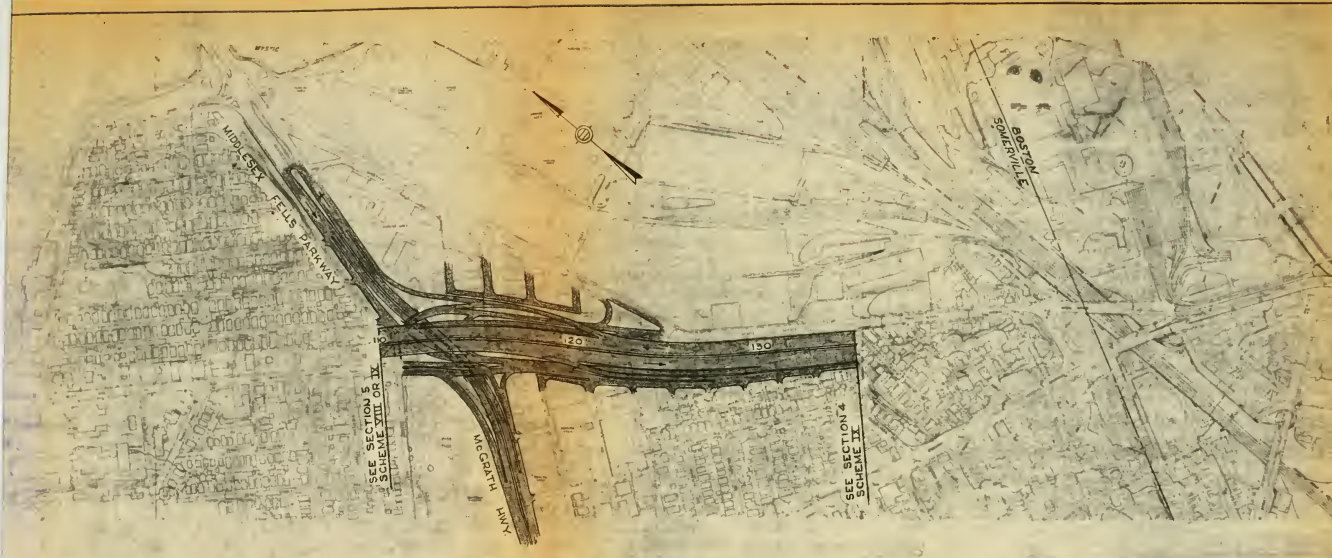
COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 4 SCHEME VII

ALL SCALE 1" = 100' JAN. 1968

RAY, WHITFORD & THORNTON, INC.
ARCHT.
CHARLES E. MAYNARD & ASSOCIATES



COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 4 SCHEME X

SCALE · 1" = 400' JAN. 20, 1965

FAY, SPOFFORD & THORNDIKE, INC.
AND
CHARLES A. MAGUIRE & ASSOCIATES





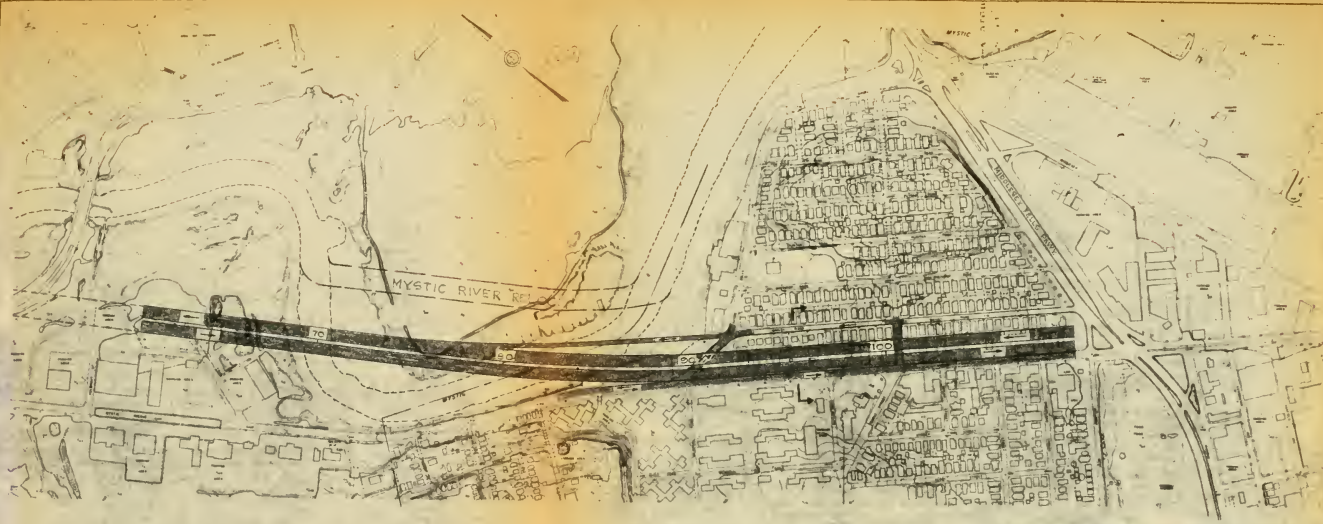
COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 5 SCHEME I

SCALE: 1" = 400' ALG. 28, 1964

FAY, SPOFFORD & THORNDIKE, INC.
AND
CHARLES A. MAGUIRE & ASSOCIATES



SECTION
NO SCALE

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 5 SCHEME II

SCALE: 1" = 400' AUG. 28, 1964

FAY, SPOFFORD & THORNDIKE, INC.
AND
CHARLES A. MAGUIRE & ASSOCIATES



SECTION
NO SCALE

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 5 SCHEME III

SCALE: 1" = 400'

AUG. 28, 1964

FAY, SPOFFORD & THORNDIKE, INC.
AND
CHARLES A. MAGUIRE & ASSOCIATES





COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 5 SCHEME V

SCALE 1" = 400' PLAN

FAY, SPIFFING & THORNDIKE, INC.
AND ASSOCIATES



COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS

INTERSTATE ROUTES 695 & 93
BOSTON - SOMERVILLE - MEDFORD

SECTION 5 SCHEME VI

SCALE: 1" = 400'

JAN. 20, 1965

FAY, SPOFFORD & THORNDIKE, INC.
AND
CHARLES A. MAGUIRE & ASSOCIATES

TRAFFIC SERVICE

All schemes provide basically the same traffic service for the Somerville area in that the same number of ramps are provided to serve approximately the same geographical areas with the same opportunity to travel on the expressway system. The analysis of the desires for local service indicates a definite need for this service which should be fulfilled. These desires show definite need for a full set of ramps between the Fellsway and Sullivan Square. The pair of ramps serving I-93 to the south should be designed so as to provide for the large volume of traffic assigned from the Fellsway which is approximately 80% of the total assignment to these ramps, the balance being Somerville traffic. The on and off ramps serving I-93 to the north should be designed so that ease of access is provided from the Sullivan Square interchange, since most of the traffic assigned to these ramps originates in Charlestown. A pair of on and off ramps serving I-93 to the north should be provided west of the Somerville line in Medford and connected to Mystic Avenue in the vicinity of the Bal-A-Roue skating rink to serve Somerville and the adjacent portion of Medford.

It is therefore essential that these three pairs of ramps be provided for service to Interstate Route 93 in the Somerville area between the Mystic Valley Parkway and Sullivan Square. These ramps will serve approximately 20,000 trips per day originating or destined for Somerville. In addition, these ramps will serve approximately 24,000 trips per day which would otherwise use streets in Somerville to reach destinations beyond.

The ramps serving I-93 to the north in Medford are most advantageous when laid out as shown by Schemes VIII and IX in Section 5. This layout of the ramps is preferable because it is simpler and concentrates the traffic movements at one point, thus making it easier to signalize and sign and easier for the motorists to drive. The movements to and from the west are relatively low and therefore this type of intersection is justified on the basis that a two-phase signal will adequately control the traffic. In addition, the right-of-way cost would be somewhat less than with the ramps spread out as shown in Scheme V.

The pairs of ramps located between the Fellsway and Sullivan Square offer the greatest advantages when laid out as slip ramps with a "scissors" arrangement as shown on Schemes VIII and IX so as to eliminate weaving on both the surface streets and the expressway. Furthermore, the ramps in this location serve the high volume desire for the Fellsway by placing these ramps closest to the Fellsway and eliminating additional travel on local streets.

Due to the heavy left turns from the Fellsway southbound to the on ramp and the frontage road, a tunnel underpass should be constructed at the intersection of the Fellsway and Mystic Avenue as provided in Scheme VIII, Section 4. While this grade separation would cost approximately 2 million dollars, its construction is essential since this intersection cannot work efficiently without this heavy movement being separated from the many other movements which must take place within this intersection.

With this left turn grade-separated, the intersection can be signalized so that all permitted movements could take place with 94% success in clearing all vehicles for each movement. However, if no grade separation is provided, as in Scheme IX, the total green time required by the three cycles would require 1.2 times the total cycle time. Furthermore, during the peak morning and afternoon periods only 40% of the cycles would be able to discharge as many vehicles as may arrive, which in turn would produce considerable congestion since less than half the cycles would clear that traffic waiting for each movement.

The ramps serving I-93 to the north, the bulk of whose assignment comes from Charlestown, are more efficient with the grade separation for westbound Broadway and eastbound Mystic Avenue as provided by Schemes VIII and IX.

The location of the pairs of ramps, as shown on Scheme V, Section 4 would place the ramps for expressway service to the south near Sullivan Square and the ramps for expressway service to the north near the Fellsway. The weaving movements of the traffic with this arrangement would then take place on the two frontage roads. While this is no disadvantage on the eastbound side, it creates a rather severe problem on the westbound side since this heavy weaving takes place on a section of Mystic Avenue at a point opposite the First National Stores warehouse, which generates a great deal of truck traffic which would interfere with the weaving operation. Furthermore, the volume of vehicles assigned to this section of Mystic Avenue

would have an adverse effect on the accessibility of the warehouse. This arrangement of the ramps has a further disadvantage in that the heavy volumes from the Fellsway moving southbound on I-93 must travel an additional 3,000 feet on local streets to and from the Fellsway. This was a principal factor in eliminating Scheme V from further consideration.

The location of the pairs of ramps, as shown on Scheme VII, would place the ramps for expressway service to the south, near the Fellsway. This would be advantageous as the bulk of this traffic desires the use of the Fellsway for the completion of its trip. The pair of ramps for expressway service to the north are laid out so as to provide direct connections from the Sullivan Square interchange, which is the origin or destination of approximately 90% of the traffic assigned to these ramps. Therefore, the location of the ramps, as provided by Scheme VII, places them in an advantageous location with respect to the origin and destination of the traffic assigned thereto. However, this arrangement has several disadvantages:

1. All the weaving of traffic assigned to each pair of ramps must take place on the expressway which will reduce the efficiency of the operation of the expressway itself.
2. While this arrangement favors the bulk of the traffic assigned to these ramps, the Somerville traffic is placed in an unfavorable position since it would have to use rather circuitous routes in order to reach its destination or to reach the ramp.

3. It would not be feasible to provide five travel lanes on the expressway in addition to a full shoulder, therefore breakdowns which may occur between the two ramp prows would seriously interfere with the weaving operation and further reduce the expressway operating efficiency. (If 5 lanes were provided with a full shoulder, it would require the taking of additional residential property which would become a disadvantage to the community.)

These disadvantages resulted in the elimination of Scheme VII from further consideration.

Although five lanes with a full shoulder are not considered feasible, as noted above, four travel lanes plus an auxiliary lane are recommended in various sections subject to the following:

It is our recommendation that these sections consist of four travel lanes and an auxiliary lane with a two-foot shoulder instead of the ten-foot shoulder. This recommendation results in a net four feet additional width between curbs for the five lane section as opposed to the four lane section. Reference should be made to the typical cross sections included in this report. This additional width is necessary to accommodate the extensive weaving, merging and diverging movements which are anticipated as well as the very high volume assigned.

Scheme VIII results in the most advantageous arrangements for the layout of the ramps and local street connections in Section 4. This scheme provides a grade separation for eastbound Mystic Avenue movement and westbound Broadway which would provide very efficient traffic service for this section of the expressway.

Schemes VIII and IX which are identical, as far as ramp design is concerned, produce the most advantageous arrangement for the layout of ramps in Section 5.

PROJECT COSTS

Reference should be made to Part I for a discussion of the basis of estimating the various construction, right-of-way and total project costs which are included herein. The costs developed for Scheme VIII of Section 5 are based on the use of a viaduct section for a distance of 2,050 feet across the Mystic River Basin to comply with the requirement of the Metropolitan District Commission to maintain the existing available water surface of the Mystic River Basin for recreational boating.

The costs developed for Scheme IX of Section 5 are based on a gravel fill embankment across the Basin, including excavation of unsuitable material and excavation of and disposal of material necessary to create an equivalent basin area entirely on the northerly side of the expressway. Reference should be made to the Soils Report for details, which will be submitted separately.

NORTHERN EXPRESSWAY - ROUTE I-93
PROJECT COST

In Thousands of Dollars

Section Number	Construction Costs							Demolition Cost	Construction Cost Plus Demolition	Engineering and Contingencies	Right-of-Way Costs	Total Costs
	Structures	Earthwork	Pavement	Utility Relocation	Miscellaneous	Total Construction Cost						
SCHEME IV												
4	13,856	176	202	536	197	14,967	150	15,117	2,245	3,512	20,874	
5	11,698	3,285	219	303	210	15,720	71	15,791	2,358	1,628	19,777	
Totals	25,554	3,461	421	844	407	30,687	221	30,908	4,603	5,140	40,651	
SCHEME VIII												
4	11,157	717	454	449	292	13,069	157	13,226	1,960	3,846	19,032	
5	8,139	2,432	317	245	250	11,383	71	11,454	1,707	1,605	14,766	
Totals	19,296	3,149	771	694	542	24,452	228	24,680	3,667	5,451	33,798	
SCHEME IX												
4	9,267	628	427	320	234	10,876	137	11,013	1,632	3,909	16,554	
5	1,913	4,387	465	245	272	7,282	71	7,353	1,092	1,605	10,050	
Totals	11,180	5,015	892	565	506	18,158	208	18,366	2,724	5,514	26,604	
SCHEME XI												
4	11,162	666	460	810	262	13,360	133	13,493	2,004	3,808	19,305	

PHYSICAL EFFECTS

A survey was made to determine the use of each property which would be taken by each of the schemes studied. These uses were then placed into one of seven (7) categories and a tabulation has been made for each of the schemes showing the numbers of each type of property which would be taken by the proposed expressway. This tabulation is shown on the next page.

INTERSTATE ROUTE I-93
SUMMARY OF PROPERTIES AFFECTED
NUMBER IN CATEGORY

CITY	SCHEME IV						Scheme Total
	SECTION 5			SECTION 4			
	Medford	Somerville	Total	Somerville	Boston	Total	
CATEGORY							
Use of Structures							
Residential	0	36	36	123	23	146	182
Retail	0	22	22	8	4	12	34
Business	0	7	7	5	0	5	12
Institutions	0	0	0	0	0	0	0
Industry	0	0	0	0	0	0	0
Recreation	0	0	0	0	1	1	1
Other Data							
Partial Land Taking	3	1	4	21	5	26	30
Vacant Lots	0	3	3	2	6	8	11
Households Displaced	0	63	63	349	58	417	480

		SCHEME VIII						
		SECTION 5			SECTION 4			
CITY		Medford	Somerville	Total	Somerville	Boston	Total	Scheme Total
CATEGORY								
Use of Structures								
Residential		0	36	36	127	23	150	186
Retail		0	22	22	7	4	11	33
Business		1	7	8	5	0	5	13
Institutions		0	0	0	0	0	0	0
Industry		0	0	0	1	0	1	1
Recreation		0	0	0	0	1	1	1
Other Data								
Partial Land Taking		4	1	5	8	5	13	19
Vacant Lots		0	3	3	2	6	8	11
Households Displaced		0	63	63	353	58	411	474

INTERSTATE ROUTE 1-93
SUMMARY OF PROPERTIES AFFECTED
NUMBER IN CATEGORY

CITY	SCHEME IX						Scheme Total
	SECTION 5			SECTION 4			
	Medford	Somerville	Total	Somerville	Boston	Total	
CATEGORY							
Use of Structures							
Residential	0	36	36	130	23	153	189
Retail	0	22	22	7	4	11	33
Business	1	7	8	5	0	5	13
Institutions	0	0	0	0	0	0	0
Industry	0	0	0	1	0	1	1
Recreation	0	0	0	0	1	1	1
Other Data							
Partial Land Taking	4	1	5	8	5	14	19
Vacant Lots	0	3	3	2	6	8	11
Households Displaced	0	63	63	361	58	419	482

CITY	SCHEME XI		
	SECTION 4		
	Somerville	Boston	Total
CATEGORY			
Use of Structures			
Residential	128	23	151
Retail	7	4	11
Business	5	0	5
Institutions	0	0	0
Industry	1	0	1
Recreation	1	1	2
Other Data			
Partial Land Taking	10	5	15
Vacant Lots	2	6	8
Households Displaced	353	58	411

SUMMARY
OF
ADVANTAGES AND DISADVANTAGES

The location of Interstate Route 93 in Sections 4 and 5 is basically the same for all schemes. The differences in the various schemes are primarily in profile, ramp locations, design of local street connections to the ramps, service roads, and the arterial street connections, and minor differences in the amount of property to be taken. The cost of the construction of the various schemes is comparable, except that the cost of the depressed section, Scheme IV, exceeds that of the other schemes by approximately \$6,000,000. The major problem in the design is the development of a plan that will satisfactorily handle the ramp service connections to the local street system without unduly increasing the cost of construction or the amount of property to be taken. All schemes will handle the through traffic on I-93 in about the same manner with a high degree of efficiency. However, each of the plans accommodates the local access and local street circulation patterns in varying degrees of effectiveness.

One of the factors influencing the design and layout of I-93 in Somerville is the acute concern of Somerville officials in preserving real estate and minimizing the number of families and businesses to be displaced. While this is a natural concern, over-emphasis of this factor could result in the adoption of a rather short-sighted plan. In order for Somerville to be competitive with other sections of the metropolitan area for the location of

industries and business and commercial operations, it must be readily accessible through direct connections with the expressway system. If the ramp service, as proposed in this report, is not provided or is in any way curtailed, it could place Somerville at a very severe disadvantage in terms of accessibility and would not lessen the congestion which presently exists on the major streets. While much of this congestion is the result of traffic having a desire between points outside of Somerville, there is in Somerville a high volume of traffic having an origin or destination within Somerville. Should the expressway not be constructed, industries and commercial and business establishments now located in Somerville might be forced to move elsewhere in the metropolitan area to obtain the accessibility which the expressway system is intended to provide for all parts of the metropolitan area.

Advantages and Disadvantages of Each Scheme

Scheme IV - Sections 4 and 5

Advantages

The depressed location in effect puts the expressway out of sight and could have some advantage in the redevelopment of properties which would front on the expressway location.

Disadvantages

1. The cost is the greatest disadvantage, being some 6 million dollars in excess of the schemes with above-grade profiles.
2. The depressed location interrupts several major sewers and overflow drains for Somerville's storm drainage and sewer

system. These must be provided with inverted siphons which would require continuous maintenance and therefore a built-in annual cost to the City of Somerville which would not otherwise accrue.

3. The intersection of the Fellsway-McGrath and Mystic Avenue handles the traffic in a less efficient manner than does Scheme VIII. This intersection is almost identical to the layout for Scheme IX, which would require a green time of 1.2 times the total cycle time. Congestion and backups in the various movements would occur during both morning and evening peak hours.
4. The layout of the ramps is less efficient than either of the other schemes because it induces weaving between the on and off ramps on the frontage road, and furthermore the ramp access points are located so that the travel distance is somewhat greater for all ramps. The pair of ramps serving the south do not provide adequate weaving distances between the major interchange and therefore would cause congestion particularly during peak hours of operation.
5. The long climb from the depressed profile to an elevated section at each end will not only increase the cost of the operation of the vehicles using the facility but will cause a much higher noise level than otherwise would be present and therefore have

an adverse effect on the abutting residential properties in East Somerville and in the Ten Hills Section.

6. In order to depress the profile beneath Shore Drive the grade of the expressway must start descending as it crosses the river. Therefore, it would be impossible to preserve the water area of the Mystic River Basin for recreational purposes which the Metropolitan District Commission has stated must be preserved as a condition precedent to their approval.

Scheme VIII, Section 4

Advantages

1. Scheme VIII provides the highest level of efficiency of handling traffic at the intersection of the Fellsway-McGrath and Mystic Avenue, including the major turning movement southbound on the Fellsway to the expressway.
2. The ramps in Scheme VIII are laid out in scissors fashion so as to eliminate all weaving from either the frontage road or the expressway, and the ramp egress and exit points are located closest to the major desire points.
3. The right-of-way cost of this scheme is slightly less than Scheme IX and its total cost in Section 4 is \$1, 850, 000 less than the depressed scheme (Scheme IV) and is \$275, 000 less than Scheme XI.

4. The physical effects are less than the other schemes except Scheme XI.
5. Produces the best layout of the expressway to effectively handle the traffic.

Disadvantages

1. The cost of construction, as a result of providing a grade-separated underpass for the left turn at the Fellsway, is \$2, 500, 000 higher than Scheme IX. However, this additional cost is entirely justified since it provides vastly superior traffic service at the Fellsway - McGrath intersection and ramp connections to the local streets.

Scheme IX - Section 4

Advantages

1. Scheme IX results in the lowest cost of construction for the expressway in Section 4.

Disadvantages

1. The layout of the intersection at the Fellsway-McGrath and Mystic Avenue has the same deficiency as does Scheme IV and, therefore, does not best serve traffic desiring to use the expressway or local and arterial traffic.

Scheme XI - Section 4

Scheme XI is very similar to Scheme VIII except that Scheme XI provides a grade separation at the Fellsway-McGrath intersection and Mystic Avenue of the northbound McGrath-Fellsway roadway instead of grade separating the left turn movement from the Fellsway to the southbound expressway frontage road as does Scheme VIII. The following advantages and disadvantages are listed in comparison of Schemes VIII and XI.

Advantages

1. The right-of-way costs of Scheme XI are slightly less than Scheme VIII.

Disadvantages

1. Expressway bound traffic is more efficiently handled by Scheme VIII than Scheme XI.
2. The total cost of Scheme XI is \$275,000 more than Scheme VIII.
3. A very small amount of land along the edge of Foss Park would have to be taken.
4. Scheme XI affects one residence structure more than Scheme VIII.

Schemes VIII and IX - Section 5

Schemes VIII and IX differ only in the method of construction and the profile elevation across the Mystic River Basin. Scheme VIII provides viaduct construction across the entire Basin with sufficient vertical

clearance to allow twenty feet clear height over the Basin. Scheme IX is constructed on embankment fill, as previously described, with a low profile to minimize earthwork and reduce the extent of protective measures necessary to stabilize the embankment.

Scheme VIII will cost approximately \$4,000,000 more to construct than Scheme IX. However, the Metropolitan District Commission has stated that a viaduct over the Basin is required to obtain their approval. The Metropolitan District Commission is of the opinion that this is in the overall public interest, that the recreational advantages offered by an unobstructed basin warrants the expenditure of this additional sum of money.

PART III

TRAFFIC ANALYSIS

INTERSTATE ROUTES 695 AND 93

BOSTON, SOMERVILLE AND MEDFORD

The traffic analysis as presented in the Inner Belt Report was used as a basis for the projection and assignment of traffic for this study. As described in that report, the desire to use the expressway system exceeded its capacity, and the assignments that were made to the expressways were therefore limited to the practical capacity of the various expressways. The assignments were made in the order of the greatest time saved to the limit of the capacity of each section. With the entire expressway system at its capacity, all trips exceeding 21.6 minutes in length were assigned to the expressways.

The assignments to the ramps of the system were not limited and were allowed to build up to that amount which would satisfy the capacities of the expressways. Once the design assignments had been made to the expressways a relatively simple process is possible to consider the assignments to each ramp to determine whether or not certain sections of the expressway system should have more or less ramp service and whether or not the ramps, as located, could be serviced by the local street system. The assignments to individual ramps did not exceed the capacity of one-lane ramps, however, in many cases it was obvious that improvements would have to be made to the local street system in the vicinity of the ramp terminals.

Since ramp assignments did not exceed ramp capacity, the total number of ramps provided to serve the expressway system should not be increased. In fact, there could be a reduction in the number of ramps if the only criteria for location of ramps were that the ramps were assigned traffic to their capacities. Ramps should be located to equitably serve the travel desires of the various sections of the metropolitan area and must also be in such a location that the local street system can accommodate the assigned traffic.

Data obtained from the computer output for the Inner Belt Report Traffic Analysis was organized to permit revision of ramp locations and ramp service and to obtain valid adjustments of assignments for alternative systems of ramps.

At the outset and during the course of this basic design study certain conclusions were reached as to the locations of the Inner Belt (I-695) and the Northern Expressway (I-93) which differed from the Recommended Route, as presented in the Inner Belt Report. Such differences in location have a decided effect upon the possible ramp locations. Some of these differences are as follows:

1. The interchange between I-93 and the Inner Belt was recommended in the Inner Belt Report to be north of the Boston & Maine Railroad yards so that it would lie partially in the residential area of East Somerville and partially in the industrial area fronting on Washington Street. This location made it possible to provide

local access ramps from both Broadway and Cambridge Street to serve the Inner Belt to the west. This location of the interchange was discarded prior to commencing this study due to the number of families displaced and the serious effect it would have on the valuable industrial properties. The interchange has now been located entirely within the Boston & Maine Railroad yards. This precludes ramp connections to the local streets in the immediate vicinity of the interchange.

2. I-93 was located in the Inner Belt Report to extend across the residential section of East Somerville. This location had the serious disadvantage of dislocating a considerable number of homes and families. In order to reduce the property takings, I-93 has been extended for a greater distance easterly along Mystic Avenue, crossing the main line Boston & Maine Railroad tracks at a point closer to Sullivan Square and thence turned southerly to parallel these main line tracks to a location in the railroad yards more suited to the location of the interchange with the Inner Belt. This location logically dictates a layout of ramps in Somerville along Mystic Avenue in conjunction with a new frontage road, a somewhat different concept from the arrangement shown in the Inner Belt Report.
3. One of the conditions established at the beginning of this study was that the recommendations of the North Terminal Area

Study be reviewed. That study recommended a major interchange between the Inner Belt and a proposed arterial highway between Leverett Circle and the Mystic River Bridge. The ramps for this proposed interchange were studied in conjunction with other possible locations of ramps and their effect upon the overall operating efficiency of the expressway system was considered.

4. During the course of the studies it became apparent that certain physical conditions would have a decided effect upon ramp locations, particularly the several ramps in Somerville.

As a result of the above-listed factors, a number of ramp systems were developed for the entire section of the Inner Belt and I-93 within the limits of this study and somewhat beyond in all directions, in order to insure that an efficient ramp service might be obtained. The provision of ramp service at each specific location was necessarily studied and evaluated in conjunction with similar service in other locations within the study area and with regard to ramp service provided in adjacent sections of the expressway.

In order to obtain assignments for the various ramp systems developed, the basic information contained in the traffic analysis of the Inner Belt Report was utilized, particularly Computer Output Reports V, VI and VII. All traffic previously assigned to the expressway system and originating

or having its destination within the influence of this portion of expressway system under study, was diagrammatically placed at the origins and destinations. Assignments were then made for each of the proposed ramp locations with regard to the desire of each movement and the existing street pattern available to serve the ramps. Four basic layouts of ramp service were developed for the section of the expressway system encompassed by this study. Assignments were made to each of the ramps and the expressways as well as the major streets within the immediate influence of the expressway system. A discussion of these various ramp systems follows:

MEDFORD - RAMPS SERVING I-93 NORTH

All of the studies provide for ramps to connect I-93 north to Mystic Avenue at right angles in the vicinity of the Bal A Roue skating rink in Medford, just northwest of the Mystic River. Some of the discarded studies, as well as the Recommended Location in the Inner Belt Report, considered providing this service in the form of slip ramps to Bailey Road and Mystic Avenue in Somerville. However, any scheme with these slip ramps would have an adverse affect on the abutting residential properties on Bailey Road and would not effectively serve the Medford area to the west of the ramp location. Therefore, such ramps are not considered desirable. The location in Medford near the Somerville line will readily serve both cities well and will not affect adjacent properties. Similar ramp service for I-93 north is not available in the Somerville-Medford area except north of the Mystic River and this location would only serve Medford north of

the Mystic River. The traffic volumes on the proposed ramps near the Medford-Somerville line are relatively light, and the movements to and from Mystic Avenue can be readily accommodated with a two-phase signal system without serious interruption of traffic on Mystic Avenue.

SOMERVILLE - FULL RAMP SERVICE BETWEEN THE FELLSWAY
AND SULLIVAN SQUARE

Analysis of the traffic desires in Somerville between the Fellsway and Sullivan Square indicates that full ramp service should be provided in this area for travel in both directions on I-93. There is a heavy demand for service to I-93 and the Inner Belt south, over 80% of which would be entering or leaving this area by the Fellsway to the north. Approximately 11,000 one-way trips are assigned to the expressway from the Fellsway traveling south on I-93. In addition, slightly over 2,000 trips per day originating in Somerville desire to make this same movement, accounting for a total assignment of a little over 13,000 trips per day for each of these ramps. The relatively high volume assigned to this pair of ramps from the Fellsway requires that the intersection of the Fellsway and Mystic Avenue and the connections to the ramp terminals must be designed to easily accommodate this movement and to minimize its interference with local traffic movements in the vicinity.

The opposite movement, that is service to I-93 north, consists almost entirely of trips from the Charlestown section of Boston with a minor amount, less than 700 vehicles, from Somerville. Since the bulk

of this traffic would be coming from or going to Charlestown through Sullivan Square, the layout of the ramps and connecting roads should be such that this movement may be readily accomplished. The plan for this combination of two pairs of ramps could take any one of three forms, all in conjunction with the use of existing Mystic Avenue for one-way traffic westbound and a new frontage road from Mystic Avenue eastbound.

- a. The four ramps can be laid out as diamond ramps connecting to Mystic Avenue eastbound and westbound in such a manner that all weaving takes place on the frontage road.
- b. The four ramps can be laid out as diamond ramps with the pair of ramps for service to the south near the Fellsway and the pair of ramps for service to the north near Sullivan Square. This configuration would require all weaving to take place on the expressway.
- c. The four ramps can be laid out as diamond ramps in a "scissors" fashion so that weaving is eliminated by grade separation of the on and off ramps on each side of the expressway.

Each of the above possibilities for the layout of this pair of ramps has been studied and presented in the various schemes for Section 4 which have been developed in the Somerville area. It should be noted that the pair of ramps serving I-93 to the north is not a duplication of this same service in Medford since these ramps are principally serving the Charlestown section, and their importance is greatly increased if ramp service to the north on the Inner Belt is not provided at Prison Point Bridge.

SOMERVILLE - RAMPS SERVING THE INNER BELT WEST

This service was provided in the Inner Belt Report within the interchange between I-93 and the Inner Belt. However, as previously pointed out, with this interchange now within the railroad yard the service should be provided to the Inner Belt at a point where it is in close proximity to Washington Street. It should be noted that this service is not otherwise provided until you reach a point in Cambridge near Cambridge Street. Since these volumes are high and there is no well defined street connection between Cambridge and Somerville through this section, it is essential that such service must be provided from Washington Street.

Furthermore, if the ramp service to the Prison Point Bridge, serving the Inner Belt north and west, is not provided the importance of these ramps is greatly accentuated since comparable service for this movement does not exist for as far back as the North End of Boston and in the vicinity of the Navy Yard in Charlestown.

BOSTON - RAMPS SERVING THE INNER BELT WEST AND I-93 NORTH
FROM PRISON POINT BRIDGE

Ramps at this location were recommended in the Inner Belt Report and are shown on two of the three ramp layouts presented herewith. However, this location must be considered in conjunction with other similar ramp service for this section of the expressway system. The desire for the use of these ramps is high, as noted from the assignments, and over 80% of the assigned volume has its origin or destination in Charlestown.

Service to the north and west on the Inner Belt for the Charlestown area must be provided. However, Prison Point Bridge is not the most advantageous location for such service in consideration of the efficiency of operation of the expressway. Furthermore, the Boston Redevelopment Authority has serious objections to providing this service at Prison Point Bridge since in their opinion it would greatly disrupt the urban renewal plans for Charlestown and the proposed local traffic circulation patterns which have been developed integrally with the urban renewal plan.

The major disadvantages in the location of ramps to Prison Point Bridge are:

1. Prison Point Bridge is in extremely poor condition and should be rebuilt for its entire length. Furthermore, the ramp volumes are high and the desires are such that simple diamond ramp connection movements could not be made to Prison Point Bridge without seriously reducing the efficiency of the ramp service. In addition, the intersection of Rutherford Avenue and Prison Point Bridge would have to be reconstructed to provide for very high turning volumes in all directions.
2. Introducing the northbound movements from Charlestown at this point on the expressway system while within the minimum standards of design would introduce severe weaving conflicts on the Inner Belt between Prison Point Bridge and the interchange with Interstate Route I-93.

3. The cost of construction of the ramps would be high since a full viaduct structure over the railroad yards would be required for the entire length of the ramps.

It should be pointed out that none of the agencies normally involved in highway improvements in Metropolitan Boston have any plans in the foreseeable future for the reconstruction of Prison Point Bridge, although the urban renewal plan for Charlestown provides for major improvement of Rutherford Avenue from City Square to Sullivan Square. This improvement of Rutherford Avenue will greatly facilitate traffic movement to and from ramp access points in Somerville. The Boston Redevelopment Authority has also announced a plan for the location of a Community College on the Charlestown Prison site. Some portion of this site would have to be utilized if ramps were constructed at Prison Point Bridge. If the ramps at Prison Point Bridge were provided, the need for ramps serving the Inner Belt westerly at Washington Street or the ramps serving I-93 to the north in East Somerville would not be eliminated. However, with ramps provided at these two locations, ramps at Prison Point Bridge could be omitted.

With ramps at Prison Point Bridge omitted the result would be increased operating efficiency of the expressway system, a substantial reduction of the total construction cost for this portion of the system, with only the slight disadvantage of requiring a somewhat greater distance of travel on local streets.

The primary advantage to the location of the ramps at Prison Point Bridge is the centralized location in the Charlestown area.

BOSTON - RAMPS SERVING THE INNER BELT WEST AND I-93 NORTH FROM A NEW CONNECTION TO LEVERETT CIRCLE FROM CITY SQUARE

These ramps are recommended by the North Terminal Area Study and have been included as part of the circulation plan developed by the Boston Redevelopment Authority in conjunction with the Urban Renewal Plan for Charlestown.

The North Terminal Area Study proposes an interchange in the Boston & Maine Railroad yard on the Charlestown side of the Charles River, between the Inner Belt and a new connection from Leverett Circle to the Mystic River Bridge (Interstate Route I-95); and an improved Rutherford Avenue extending from Sullivan Square into the North End of Boston, utilizing the Charlestown High Level Bridge as the northbound roadway and a new bridge at the proposed Charles River Dam at Warren Avenue as the southbound roadway.

On the basis of the traffic analysis developed for the Inner Belt Report, 54,000 vehicles per day desire to travel between Leverett Circle and the Mystic River Bridge (I-95) but only 30,000 vehicles are assigned to the proposed facility due to the capacity restriction of the expressway. This traffic movement is presently accomplished via the ramps behind North Station to the Central Artery, and after construction of the Inner Belt this traffic would have to weave on the existing three (3) lane Central

Artery, with the main stream of through traffic traveling north and south between the Inner Belt and the Central Artery. The provision of an alternative and direct means for this traffic to reach the Mystic River Bridge and eliminate the weaving on the Central Artery would thereby greatly improve the operating efficiency of the expressway. Furthermore, the high volume of traffic demand dictates that a direct connection should be provided between Leverett Circle and the Mystic River Bridge.

The Sullivan Square improvement presently carries traffic from two major arterial streets, Broadway in Everett and Mystic Avenue in Somerville, and funnels it into a grossly inadequate narrow Rutherford Avenue in Charlestown from which the traffic follows devious routes into the North End of Boston either by Prison Point Bridge and the Charles River Dam or by the Charlestown High Level Bridge. This is a serious bottleneck on one of the only three routes for traffic to enter Downtown Boston from the northeast. The Inner Belt Report showed that a serious capacity deficiency existed in this area by the comparison of traffic desires entering and leaving Boston from the northeast with the capacity available on expressways and arterial streets. Rutherford Avenue has an estimated desire of 70,000 to 80,000 vehicles per day in 1985 and therefore should be extended as an improved arterial street from the end of the existing Sullivan Square project through the edge of the Boston & Maine Railroad yards, across the Charles River into the North End of Boston.

The proposed Leverett Circle to Mystic River Bridge facility and the proposed Rutherford Avenue improvement would cross in the vicinity of City Square, Charlestown. Due to the high volumes of through and turning traffic at that juncture, it would be highly desirable to provide a grade separation at least for the through traffic between Leverett Circle and the Mystic River Bridge. An at grade crossing of these movements, although feasible, would be considerably less efficient and would indirectly reduce the efficiency of the expressway system and Storrow Drive by tending to direct part of the Mystic River Bridge to Leverett Circle traffic to the Central Artery via the existing North Station ramps.

A special study is being made of the feasibility of providing direct grade separated connections between Leverett Circle and the Mystic River Bridge.

The installation of ramps to and from the Inner Belt, as proposed in the North Terminal Area Study, are not considered to be feasible at this time for a number of reasons. The North Terminal Area Study traffic projections assign 20,000 vehicles per day to each of these ramps. This report contains no assignment for these ramps because they would duplicate service which already exists and which is not programmed to be eliminated, and they would duplicate new service which must be provided elsewhere to serve other areas that would not be served by these ramps. Any traffic assignment to the ramps proposed by the North Terminal Area Study would be somewhat arbitrary since assignments to ramps that are already in

existence and are now providing efficient service would have to be reduced. If the existing ramps back of North Station and north of City Square on I-95 providing this same service were eliminated and the ramps in Somerville providing northbound service on I-93 were not included in the adopted design, the volumes on this pair of ramps could reach the assigned volumes presented in the North Terminal Area Study Report. This would require two-lane entrance and exit ramps. Two-lane ramps are not considered operationally feasible and would seriously impair the operational efficiency of the expressway itself. This fact has been substantiated through experience with the operation of the existing expressway system in Metropolitan Boston. If these ramps were made one-lane ramps they then would simply duplicate the service which is already provided by the ramps at the rear of North Station and on I-95 north of City Square. Not only do the ramps at the rear of North Station presently exist but their connection in Leverett Circle provides a direct movement to Storrow Drive without interference or weaving with other traffic in Leverett Circle by virtue of the westbound traffic passing under the Circle in a tunnel and the east-bound traffic making a right turn without weaving with other traffic in the Circle. The ramps north of City Square on I-95 should be retained to provide the expressway service for the demand as indicated by the relatively high volume of the assignment to these ramps. These ramps should be relocated to provide greater weaving distances if this section of the expressway (I-95) should be re-built.

At such time in the future as the connection from Leverett Circle to the Mystic River Bridge has been constructed and Leverett Circle has been reconstructed so that such a connection would be operationally feasible then the construction of ramps to the Inner Belt might be considered feasible.



BASIC DESIGN CRITERIA

INTERSTATE ROUTES 695 AND 93

DESIGN SPEED:

60 M.P.H. Route I-93 from end of present construction in Medford to Mystic Avenue crossover.

50 M.P.H. Route I-93 to Route I-695 and I-695 to Route I-95.

40 M.P.H. Connection of I-695 to I-95.

25 M.P.H. Local access ramps.

Other Design Features

All of I-695 and I-93 included in this basic design are to be controlled access facilities permitting access and egress at ramps only. Eight travel lanes are generally recommended except for direct connectors between interstate routes and a portion of I-93 between the Fellsway ramp connectors and the interchange with I-695 for which ten lanes without a breakdown lane is recommended.

Recommended typical sections shown on the accompanying drawings indicate the basic design elements which will serve as a basis for estimating construction costs and acquisition of right-of-way.

It is proposed that 12-foot travel lanes, 10-foot paved right shoulders and 4-foot paved left shoulders be provided throughout except as follows:

Where the roadways are on structures or in certain cases where high retaining walls with parapets are required, it is proposed that the right shoulder be reduced to 9'-3" with a 9-inch safety walk or "brush curb" making a total of 10 feet from travel lane to parapet. The left shoulders in such cases should remain at 4 feet as stated above.

All ramps for local access are proposed to be 22 feet wide except at entrances and exits in accordance with Department of Public Works Standards.

Basic Design Criteria (Continued)

The minimum vertical clearance proposed is 14'-6" in all cases. In interchange areas, where the roadways are on two-level viaducts, the size of the directional signs for the lower level must be reduced so as to fit within the space available without adversely affecting the profile of the upper roadway. Adequate directional signs are possible under these conditions.

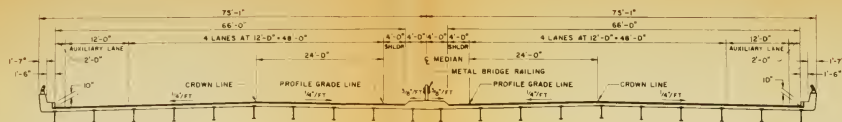
All structures over the Boston & Maine Railroad tracks will provide 22'-6" clearance above top of rail.

GEOMETRIC DESIGN CRITERIA

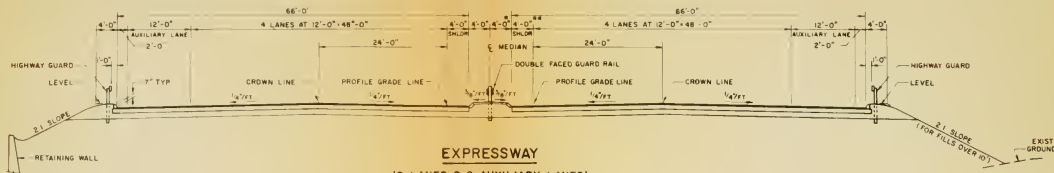
	DESIGN SPEED			
	<u>60</u> <u>M.P.H.</u>	<u>50</u> <u>M.P.H.</u>	<u>40</u> <u>M.P.H.</u>	<u>25</u> <u>M.P.H.</u>
Horizontal Curves:				
Radii:*				
Desirable	4600'	3300'	-	-
Desirable, Min.	-	1000'	-	-
Absolute, Min.	1260'	830'	500'	150'
Superelevation, Max.	.06	.06	.06	.06
Grades:				
Desirable, Mas.	3.0%	3.0%	3.0%	4.0%
Absolute, Max.	3.0%	5.0%	5.0%	6.0%
Desirable, Min.	0.5%	0.5%	0.5%	0.5%
Absolute, Min.	0.4%	0.4%	0.4%	0.4%
Vertical Curves:				
Curvature, K:				
Crests:				
Minimum	160	85	55	18
Sags:				
Minimum	105	75	55	18

* Compound transition curves required for radii less than that indicated "Desirable".

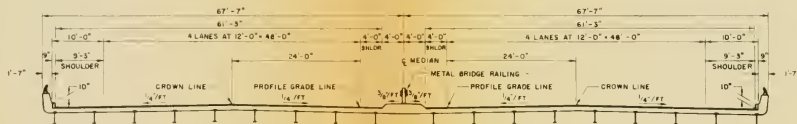




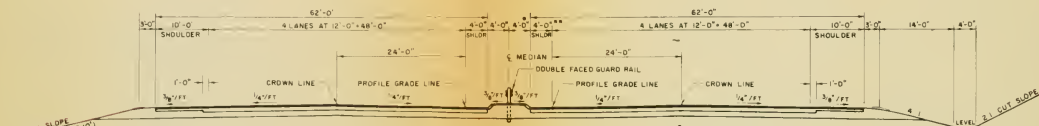
VIADUCT
(8 LANES & 2 AUXILIARY LANES)



EXPRESSWAY
(8 LANES & 2 AUXILIARY LANES)



VIADUCT
(8 LANES)

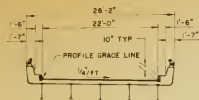


EXPRESSWAY
(8 LANES)

* TRANSITION TO 8'-0"
** TRANSITION TO 2'-0"
TO MEET PRESENT LIMIT OF I-93 CONSTRUCTION
AT STA 60+30

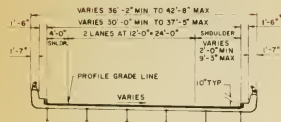
TYPICAL SECTIONS INTERSTATE ROUTES 695 & 93 PART I



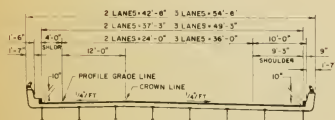


RAMP VIADUCT

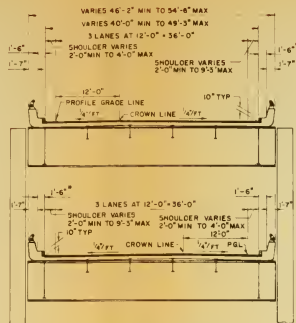
* WHERE SHOULDER IS 6'-0" OR GREATER, REDUCE WIDTH TO 9'



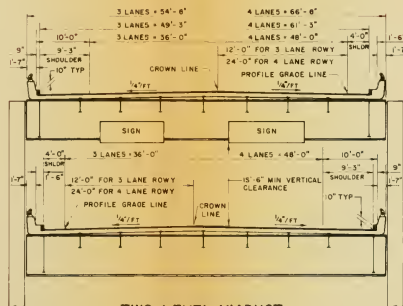
DIRECT CONNECTOR VIADUCT
LINE "C" & "E"
SECTION I



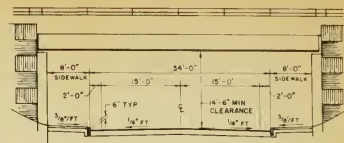
DIRECT CONNECTOR VIADUCT



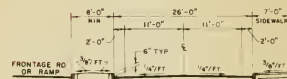
TWO LEVEL VIADUCT
LINE "A" & "AA"
SECTION I



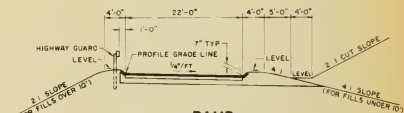
TWO LEVEL VIADUCT



LOCAL STREET UNDER EXPRESSWAY
SHORE DRIVE & TEMPLE STREET



MARGINAL ROAD

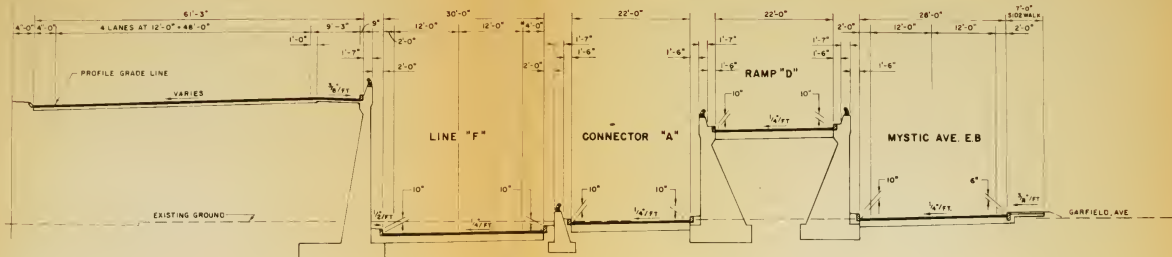


RAMP

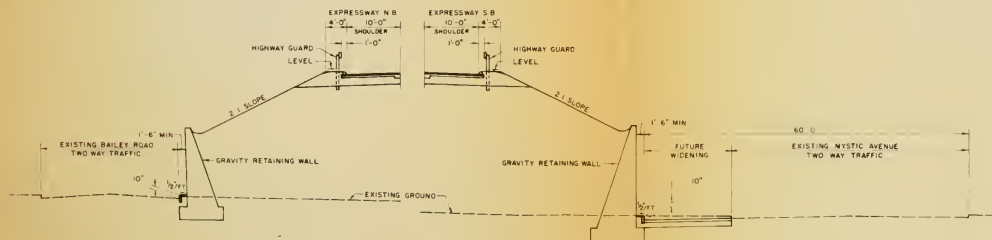


4 I-93

*4'-0" MINIMUM
8'-0" PREFERABLE



SECTION AT STA. 121 + 50 I-93

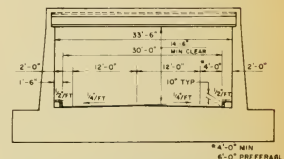


PARTIAL SECTION

I-93 NORTHBOUND EXPRESSWAY
@ BAILEY ROAD

PARTIAL SECTION

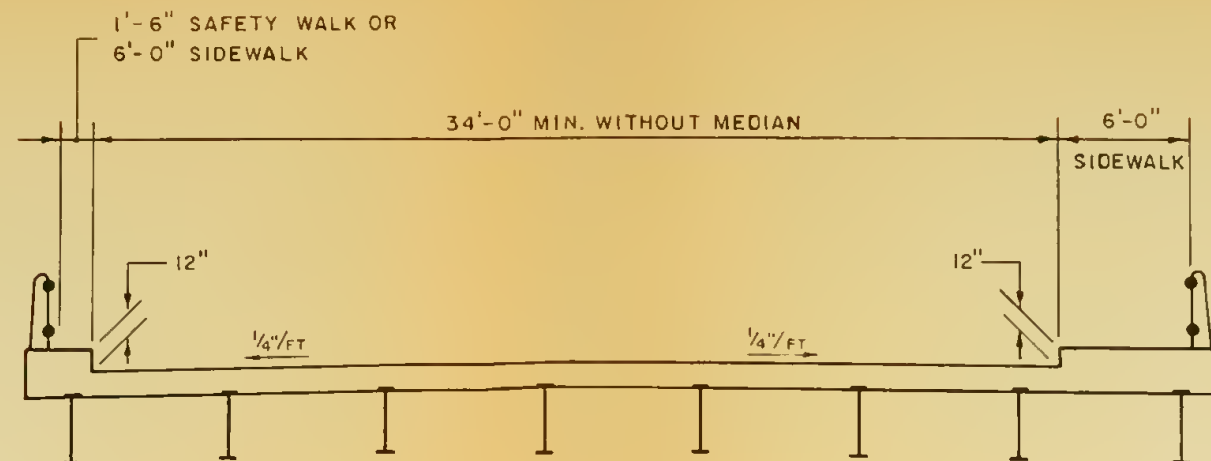
I-93 SOUTHBOUND EXPRESSWAY
@ MYSTIC AVENUE



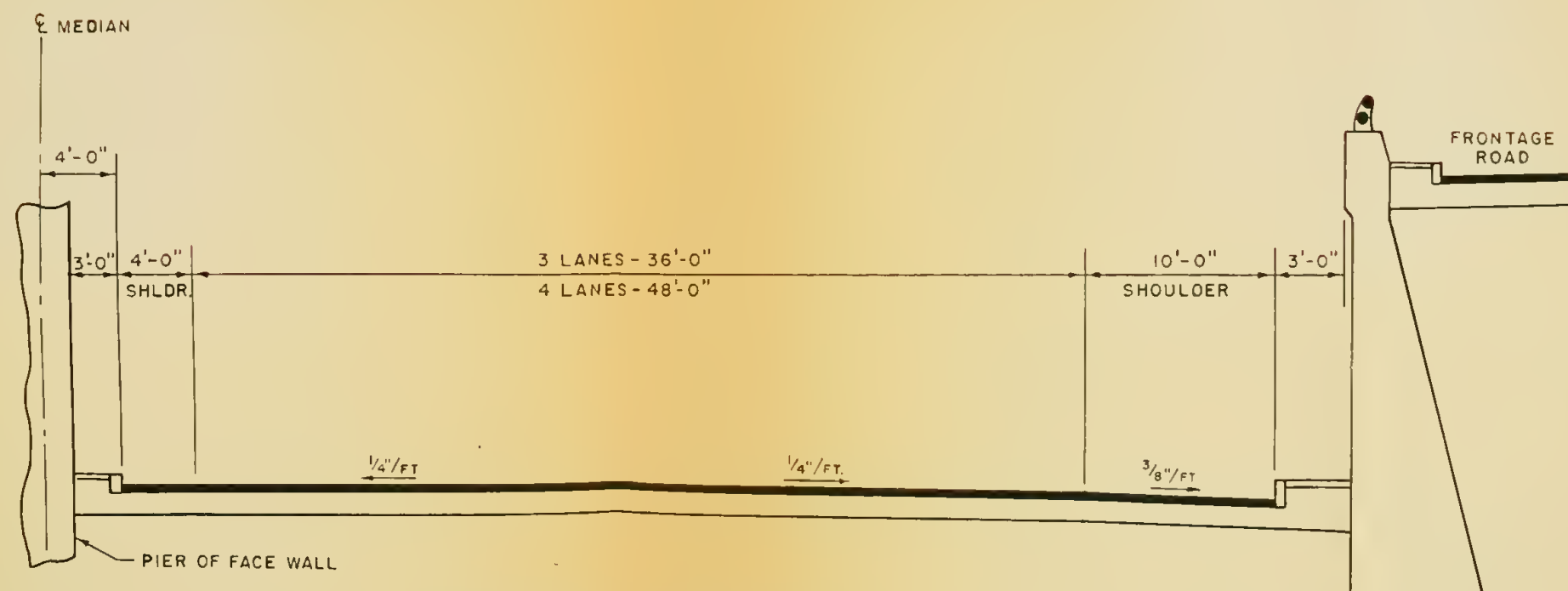
TWO LANE TUNNEL

*4'-0" MIN
6'-0" PREFERABLE

TYPICAL SECTIONS INTERSTATE ROUTES 695 & 93 PART III



LOCAL STREET OVER EXPRESSWAY



DEPRESSED EXPRESSWAY
(HALF SECTION)

TYPICAL SECTIONS INTERSTATE ROUTES 695 & 93 PART IV

COST BENEFIT ANALYSIS

A cost benefit analysis of all project costs for that portion of the Interstate System included within the scope of this Report has not been made for the following reasons:

1. All of the various possibilities for the location of the Interstate System are relatively close to each other, and therefore the differences in time and distance of travel between various routes is insignificant.
2. If savings are not accrued in either time or distance of travel, the cost benefit analysis would show the same relationship as the project costs.
3. Each of the alternative locations are similar as to type of construction and, therefore, the annual costs of the expressway system would bear the same relationship as the total cost.
4. Significant factors are associated with each of the possible locations within the limits of the scope of this study which would dictate the most feasible location and would override any advantage which may be in evidence from the cost benefit analysis.

COMPARISON WITH 1965 INTERSTATE HIGHWAY ESTIMATE

The portion of Interstate Routes 93 and 695 presented with the scope of this Report is very similar in location to the location which was used as a basis for preparing the 104(B)(5) 1965 Interstate Highway Estimate. The principal difference is in the location of the interchange between I-695 and I-93, which is approximately 1,000 feet easterly of its location in the 1965 Estimate. This difference lengthens I-93 by approximately 500 feet.

The ramp locations recommended in this report do not coincide with the locations of the ramps on which the 1965 Estimate was based, although four pair of ramps provide traffic service comparable to four pair which were included in the 1965 Estimate. One pair of ramps included in the 1965 Estimate have not been included in this Report since arterial street improvements proposed in the urban redevelopment of Charlestown make this pair of ramps unnecessary.

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T35 Fay, Spofford & Thorndike
Fay Draft of final report Inter-
Dra state Routes 695 & 93.
Rou

